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NEW ZEALAND JOURNAL OF Agriculture

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Minister of Agriculture

This Month's Cover

New Zealand's native flora generally is not noted for abundance of blossom, and white flowers are by far the most common. However, the best-known native clematis (Clematis indivisa) *makes a spectacular showing, whether in its natural surroundings of sub-tropical rain forest or in home gardens and parks. The profuse blossom of this vigorous climber forms the subject of this month's cover, which has been reproduced from a colour photograph prepared by Perry Photographer.*

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REGISTERED AT THE G.P.O., WELLINGTON, AS A MAGAZINE

Research Principles Practically Applied in

Milking the Dairy Herd

THE milking routine used in the dairy herds at the Ruakura Animal Research Station of the Department of Agriculture and which the Station believes is eminently practical was described at a conference at Ruakura recently by J. D. McG. Cowan of the Station staff. The method applies the lessons learnt from much research in recent years, and though reports on milking research often appear complicated and baffling, the speaker showed that good results follow the incorporation in the milking routine of the principles recommended. The following article is an adaptation of Mr. Cowan's paper.

ABOUT a third of a dairy farmer's working life is spent in the milking shed. As this represents such a large proportion of his time, careful planning is warranted to eliminate wasted effort. In addition, the way in which the milk "crop" is "harvested" each day affects the over-all efficiency of production on the dairy farm. Milking management therefore cannot be ignored in the search for improvement of dairy farm production.

Methods of milking used by farmers milking high-producing herds are numerous. There are the extremes: Those who hand strip and those who practise complete non-stripping. This variability may make many wonder if anyone can definitely say what is and what is not good milking technique. However, time, effort, and contamination are important factors that can be measured. The obvious attack is, then, to use a system that keeps the time involved, the effort required, and the contamination of milk produced to a minimum without inhibiting the milk-producing ability of the herd.

Milking may be conveniently divided under the following headings:—

The milker and stock handling.

Milking.

The machine.

For the best results each must be organised and handled so that it does not hinder the others in any way.

The Milker and Stock Handling

Whatever methods are practised by milkers of high-producing herds it is certain that much of their success originates in the way in which they handle and understand their stock. The attitude of the milker is most important. If he is interested and observant, there is little doubt that he will attain good results.

A good milker is recognised by the way he handles and moves among his stock. His attention should be on the job all the time. This should be automatic; not strained, but so natural as to have become second nature. He moves with decision, attends to detail, and notices anything unusual. There is no hurried or unnecessary movement; he gives the impression of being able to predetermine where his attentions will be required and moves accordingly, so that his actions ease his own path. Finally he must have the ability to do a little self-analysis occasionally so that he recognises whether or not he is advancing with the times and is maintaining a higher than average standard.

Regular habits are important because of the effect they have on the herd. Continuity of movement is necessary so that an efficient shed routine is maintained.

Stock handling ability will govern the success or failure of a milker to a very large degree. This ability is measured by the amount of confidence the animal has in the milker and the degree of control he has of the animal. Fairly good results can be obtained by milkers who have little stock sense, provided they maintain a set routine. The main failing of these milkers is that they cannot cope with or understand the cause of abnormal situations that do crop up. This represents the difference between an average milker and a good one.

Milking

The milking process can conveniently be dealt with in three steps:—

1. The principles of milk let-down.

Ruakura principles of milking herd management being explained to farmers by Mr. Cowan at the field day at this year's Ruakura Farmers' Conference. Niederer photo.

2. Milking the herd.

3. Training the first calver.

Milk let-down is controlled almost entirely by hormones. Only a small proportion of the total milk can be drawn without the aid of the hormone oxytocin, which is a secretion of the pituitary gland. It is released into the bloodstream and is controlled by the stimulation of the teats if the cow is trained to react to that treatment as a final stimulus. It acts by contracting the smooth muscle fibres in the udder, which results in the milk held in the secretory tissue being squeezed out. The shortest time in which it can become effective is 20 seconds from the beginning of stimulation. The average time is between 30 and 40 seconds.

If the animal is upset or frightened, adrenalin is released into the bloodstream, resulting in the suppression of the oxytocin action. The action of the let-down hormone will last between 4½ and 5½ minutes when the cow is properly stimulated, but its effectiveness tails off toward the end of this period. Therefore the aim is to operate so that the actions of the milker coincide with the reflexes of the cow. It should then be possible to withdraw all the milk as quickly as it becomes available, which is the aim once the cow enters a bail.

To stimulate effective let-down the floor of the udder should be washed vigorously, 2 or 3 squirts of milk removed from each quarter, and the teat-cups applied immediately.

Stimulating Let-down

To stimulate effective let-down the floor of the udder should be washed vigorously, 2 or 3 squirts of milk removed from each quarter, and the teat-cups applied immediately, the operation taking between 30 and 40 seconds. This ensures that complete stimulation is attained and also that teats are reasonably clean. A simple test of the efficiency of this procedure is that the Ruakura type indicator should be full by the time the milker stands up after applying the cups. Properly stimulated cows maintain a **high** flow rate that ends without any prolonged **low** flow rate at the end.

Increased flow half-way through milking is the result of incomplete stimulus before the teat-cups are applied, the action of the machine providing stimulus.

A second let-down late in milking is usually due to poor original stimulation or poor use of the stimulus attained by delayed application of the cups. That is, the milk has not been drawn off as quickly as it has become available. The second let-down occurs after some form of vigorous massaging of the udder or machine stripping.

Once the indicator clears the cups should be removed. It is then too late to start any form of machine stripping. Reliable sight glasses are essential for fast, clean machine milking. A good one is easily kept clean and indicates clearly when it is no longer worth while leaving the cups on. Experienced milkers can tell whether or not the cow is completely milked when they take the cups off. This ability is the result of knowledge of individual animals and experience.

Machine Stripping

If machine stripping is necessary, it should be started when the indicator begins to clear. In most cases help can still be expected from the action of the hormone and cup crawling is arrested. The time taken to machine strip individuals should decide the method to use. Cows that take a fairly long time should have weights put on the claw. A weight of about 3lb. is satisfactory. If machine stripping is short and is not going to tie the milker's attentions to one cow for long, machine stripping should be done by pressing down on the claw. The milker should not keep trying to drag that little extra milk out once the indicator has cleared. The little bit gained at this stage can be costly both in the time and the effect it has on the cow.

Complete Non-stripping the Aim

Complete non-stripping should be the aim of all progressive farmers. At the beginning of the season all cows should be given the chance to prove whether or not they respond to non-stripping. By training and selection it should be possible to develop a herd of which a large proportion are not stripped within a fairly short period, the whole basis of the system being good stimulation and the removal of the cups when the indicator clears.

Handling of First Calvers

First calvers are in a special category. They are easily ruined by poor handling at calving. Training and conditioning of the cow start from the time she is born. Gentle handling and as much of it as possible are the basis for attaining the co-operation required. An endeavour should be made to run heifers through the shed a few times before they calve. One major cause of agitation has then been lessened and they are less likely to frighten themselves during the first few critical milkings by getting into awkward situations. This practice will ease the strain over the busy calving period. The importance of patience and the need to eliminate causes of likely worry to the animal are emphasised. Progress in some cases may be slow, but the patient and tactful milker will gain the desired results. Trouble is experienced at this stage mainly because of lack of control by the milker both of himself and the cow. The first fault is frequently brought about by the second. Therefore it is necessary to have a layout which enables the milker to have firm but gentle control.

At calving the 2-year-old has not developed any fixed habits. This is the time to develop habits that will be conducive to good milking and shed routine. All 2-year-olds should be trained to enter **any** bail. If they

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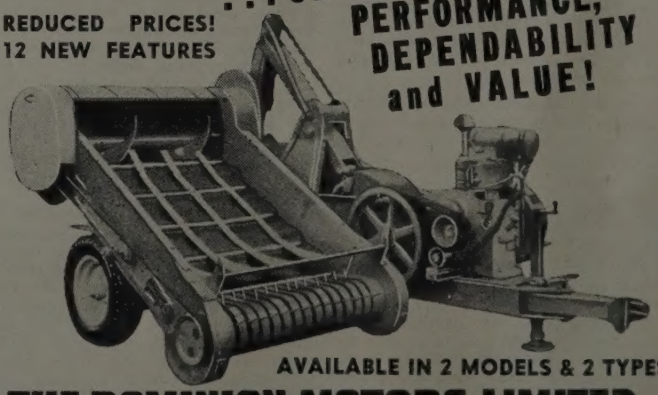

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HANDLING FIRST CALVERS IN THE SHED

[*National Publicity*

Training and conditioning of cows should start from the time they are born.

begin to show a liking for a particular bail after such training, the milker should try to allow for the whims of individuals within the framework of the shed routine. The more set habits become the greater is the effect on the chain of reflexes that result in milk let-down.

Leg-ropes should be eliminated as soon as possible; they are dirty and waste time. Much of the kicking by 2-year-olds that occurs in sheds is due to leg-roping.

The crux of the problem of attaining a let-down in 2-year-olds is to associate the easing of tension and pain on tender, inflamed udders with the milking process. This can be done only if milk is flowing while the teat-cups are on. If the flow lasts only for a short time, remove the cups immediately and resort to gentle hand milking until another let-down is obtained; then apply the cups again. An effort should be made to ease the tension by the early removal of as much milk as possible.

Provided the udder is sound, there is no harm in using the machine the day after calving. The 4-day period after calving then provides a useful opportunity for training. If there is no marked improvement a week to 10 days after calving, a veterinarian may be able to help by injecting pitocin. Once again the easing of tension should be associated with the action of the milking machine.

Reference is often made to cows that will not respond to what is considered good milking practice. These cows do exist, but they are not as common as many milkers believe. Some cows are physically handicapped by abnormal teat canal structure; others have teats that merge into the mammary gland without any distinct finish to the teat. This shape allows cup crawling to take place more readily than will a well-defined teat. There are cows that have been ruined by bad milking technique and remain so because milkers convince themselves that they will not respond to **good** milking technique. Cows can inherit poor milking characteristics and animals of this type need to produce at a high level to warrant retention in a herd where high output per labour unit is required.

The Machine

A necessary quality of a milking machine is that it should be able to withdraw the milk as quickly as possible without upsetting the cows. It should be made so that it can **easily** be kept hygienic and is **easy** to operate.

Other Shed Practice

The order in which individual cows should be milked is a controversial subject. Under New Zealand conditions a set order is not practicable or necessary, but it is desirable for each cow to be milked at as near the same stage as possible in each milking. This can be done by maintaining a regular shed routine and is done in many sheds. If the shed routine is of a good standard, there is little deviation in the order of milking. The foregoing has particular reference to a herd in which the milk of every cow at each milking for several seasons had to be weighed. The order of milking was remarkably constant, though not deliberately arranged so.

Milkers using a regular and good routine regard animals with suspicion if they vary their time of entry to any marked degree. Often it is a sign that they are suffering from some disorder such as bloat, colic, or mastitis or that they are in season. Cows in a well-handled herd tend to bail up of their own accord. This, besides saving time, indicates that they are contented and enter in a co-operative mood. Milkers operating a sound system automatically tend to bail cows up in order. Time can be saved by bailing 2 or 3 cows up at once instead of individually when it is necessary to bail up.

The number of sets of cups a milker can handle is governed by his ability to remove them at the correct time so that normally only one indicator is clear at any time during milking. The amount of changing should allow the milker to maintain continuity of movement. If he has to rush about the shed, cows will be kept alert and uneasy.

A very good milker can handle three bails doubled up or four single bails, this being dependent on the herd, the machine, and his willingness to leave a set hanging up if he strikes trouble. The average milker seems to find three single bails, two bails doubled up, or 2 single and one double the most comfortable to handle.

In some cases the number of sets of cups is not enough to hold the concentration of the milker. This also can result in unnecessary fiddling with cows, again causing bad milking habits. Finally, milking times should be regular. Within limits the interval between milking is not important, but the herd should be milked at the same time each day.

Strip Cups

Careful milkers should not need to use strip cups provided they watch for abnormal milk when squirts are taken from each quarter and keep the shed floor under the cow clean. Here a ½in.

Cows in a well-handled herd tend to bail up of their own accord.

water pipe supplying water to each bail helps.

Weaknesses in Milking

Weaknesses in milking methods can be detected by a keen observer by watching the whole herd go through the shed and then asking the following questions:—

1. Are the cattle nervous because of rough handling or are there a few vicious cows with horns?

2. Are a high proportion of cows having double milk let-down; if so, are the cows properly stimulated before the cups are applied?

3. Is the milker maintaining a regular routine of good standard?

4. Are the cups falling off because of:—

(a) Slack, greasy inflations.

(b) Blocked air holes in the claws.

(c) Too low a vacuum; or are the cows kicking them off because of too high a vacuum? (Generally a range of 10in. to 20in. of mercury is suitable, but 14in. to 15in. is safest.)

5. Are various machine components showing signs of wear or sluggish performance?

6. Are there vacuum fluctuations, due to insufficient reserve, inefficient regulators, or poorly seated releaser flaps? If such faults are suspected, this can be checked by calling in a Dairy Farm Instructor, who is trained and equipped to test machines. Vacuum gauges should not be relied on.

7. Is the releaser flooding, thus indicating too low a capacity or faulty pulsation?

Summed up, the main considerations in milking are:—

Stock must be gently handled.

A regular shed routine must be maintained and kept as simple as possible.

Cows must be thoroughly stimulated before the teat-cups are applied.

Cups must be removed when the indicator clears.

Jersey cattle should be milked in an average milking time of 4½ minutes.

Retirement of Mr. R. D. Steel

MR. R. D. STEEL, Private Secretary to the Minister of Agriculture, Mr. Holyoake, has retired after 40 years' service, the last 15 of which have been as Private Secretary to the last five Ministers of Agriculture.

Mr. Steel was educated in Dunedin and joined the clerical staff of the Department of Agriculture, serving in Dunedin and Wellington. At the Department's head office he was personal clerk to the then Director-General of Agriculture, Dr. C. J. Reakes. In the middle 1920s he was stationed in London.

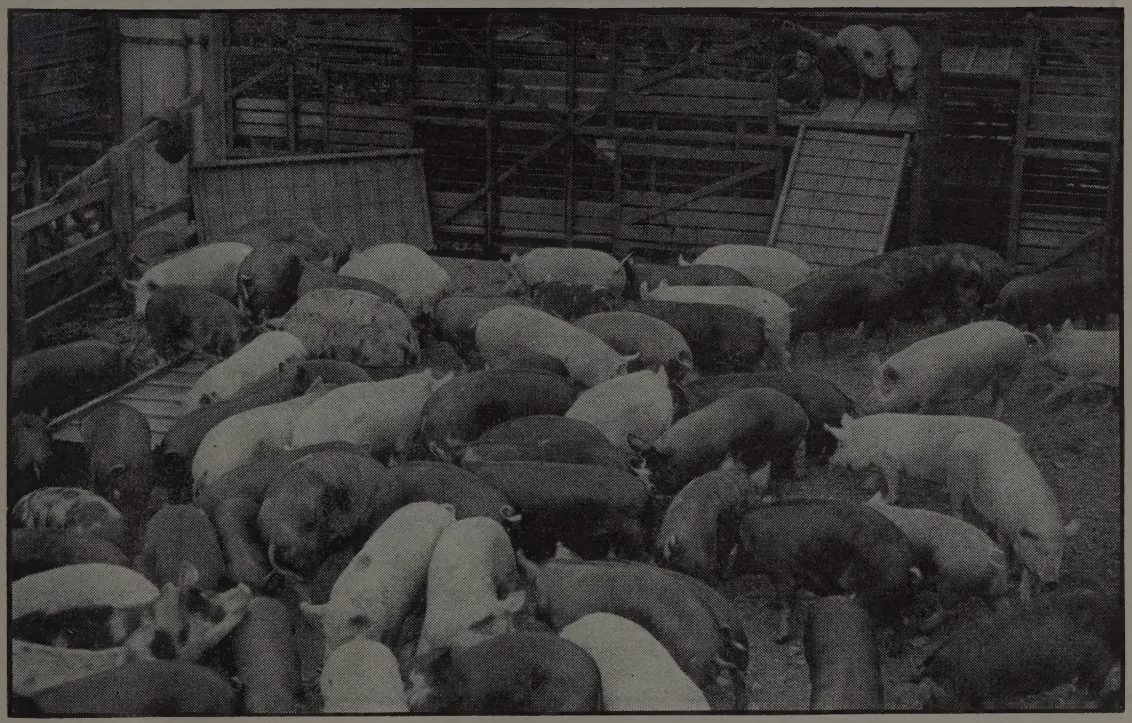
Before he became Private Secretary to the late Mr. W. Lee Martin in 1941 Mr. Steel was secretary to the Executive Commission for Agriculture and chief clerk to the Marketing Department.

[*S. P. Andrew*

Mr. R. D. Steel.

Mr. Steel's long and varied association with the agricultural industry was reflected in the unobtrusive efficiency with which he carried out his secretarial duties, and the respect and esteem in which he was held have been evident in the tributes that have been paid him by Mr. Holyoake, producer organisations, and other bodies on his retirement. Outstanding too was the warm approval expressed at the recognition of his services by the award of the Imperial Service Order in the Queen's Birthday Honours this year.

Though in the last 15 years of his service Mr. Steel was not an officer of the Department of Agriculture, he continued to be closely associated with that Department and before his retirement he was met by senior officers and was made a presentation on their behalf by the Director-General of Agriculture, Mr. E. J. Fawcett.



Feeding Pigs on Home-separation Dairy Farms in November and December

THE feeding of pigs during November and December, when production from the dairy herd is at its peak, presents certain problems that are dealt with in this article by I. H. Owtram, Extension Officer in Pig Husbandry, Department of Agriculture, Wellington.

AT first sight it might not appear that the feeding of pigs on the dairy farm during November and December and quite possibly January as well could be in any way a problem. That is the time of year when the supply of skimmed milk for the pigs is at its highest point, but because of this considerable care must be taken if really high-quality baconer carcasses are to be produced.

When there is plenty of food for pigs the temptation to overfeed the big ones that are rapidly approaching finished baconer weights is very great. Overfeeding can be done quite inadvertently, as the pigs themselves have such excellent appetites and something must be done with all the skimmed milk. The real trouble, however, is that if a pig over 120lb. is fed all it will eat, the result is an overfat carcass that cannot, whatever is done to it, be made into really first-class bacon. The low value of overfat carcasses to the bacon-curing industry in the United Kingdom, where baconer carcasses are subject to payment on grade, is shown by the fact that an overfat carcass may return as much as £7 less to the farmer than a first-grade carcass of the same weight.

Daily Food Requirement

A pig of 120lb. liveweight, which means that the carcass weight is approaching 90lb., requires 4½ food units per day. At this weight and onward skimmed milk alone can be satisfactorily fed and a pig can quite comfortably consume 4½ gallons per day. As the animal grows on from this weight it can and will, if allowed to, consume larger and larger quantities of food, with the undesirable result of overfatness. To produce a really good baconer carcass the food given must be restricted from the time the pig reaches 120lb. liveweight.

As the pig grows the quantity of food given must be increased, but not to the full appetite of the animal. The following table can be used as a guide in feeding fattening pigs from a liveweight of 120lb. onward. The table is given in food units. If the pigs have access to good pasture, from ½ to 1 food unit can be credited to this and the remainder fed as skimmed milk. If the pigs have no grazing, the total quantity can be fed as skimmed milk.

Liveweight of pig (lb.)	Food units per day
125	4.5
134	4.8
143	5.0
152	5.2
162	5.4
173	5.7
183	6.0
193	6.2
203	6.5

HEADING PHOTOGRAPH: Large numbers of baconers are sent to the works in December and January. Their quality depends on how they were fed during the 2 months preceding slaughter. Green and Hahn photo.

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At 200lb. liveweight the carcass weight will be 150lb., which is an excellent weight at which to dispose of baconers. The farmer who has a set of scales will, of course, have no difficulty in ascertaining the weight of his pigs. Those who have not scales will have to estimate the weight on an age basis. A well-grown healthy pig should reach 120lb. liveweight at 4½ to 5 months old and will put on 9lb. to 10lb. liveweight per week, reaching a weight of 200lb. at 6½ to 7 months.

Value of Greenfeed

In the feeding of fattening pigs two points are important: First, if the pigs are confined in a fattening house and do not get any grazing, the use of a little greenfeed will be beneficial in avoiding constipation and keeping them in good, healthy condition. For this purpose a small area of silver beet or beet spinach grown at the piggery is very useful. Two or three handfuls should be given every day to each pen of fattening pigs. This crop will last a long time provided all seed heads are removed as soon as they appear, and a very small patch will provide a surprisingly large amount of greenfeed. Fresh lawn clippings can also be used for the same purpose. At this time of year lawns need frequent attention and cut grass is therefore readily available for the pigs.

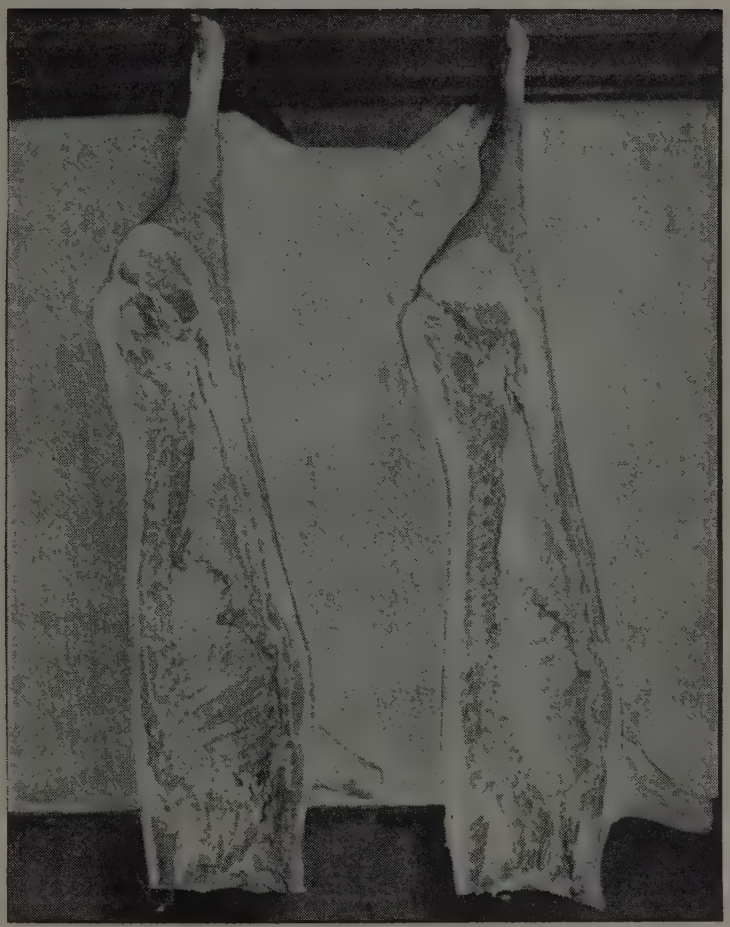
Taint from Use of Fish Oil

Secondly, the use of fish oil as a vitamin supplement for pigs is now quite common, but apparently some farmers do not realise the necessity of ceasing to feed this at least a month before the pigs are killed. If this is not done, there will be a fish taint in the finished bacon which is most unpleasant to the consumer. Unfortunately this taint does not become apparent until the bacon is cooked. The only way to avoid this is to stop the feeding of this material during the last 4 or 5 weeks of the fattening period.

Pigs requiring the vitamins contained in fish-liver oils, such as those kept continually housed without greenfeed, should preferably be given one of the synthetic forms of vitamins A and D now available on the market. These are in granular form and can easily be mixed in the correct proportion with the meal portion of the ration or merely spread on the milk in the trough.

Preservation of Curd

As stress has been laid in this article on the importance of restricting the feeding of fattening pigs, reference to the disposal of surplus skimmed milk during the flush of the dairying season might be advisable. Ideally if the farrowing dates of the breeding sows on the farm have been properly arranged, the maximum number of pigs should be on hand during November and December, but even if this has been achieved, it is likely that more skimmed milk will be available than should be given to the pigs.



The carcass on the left will make first-class bacon, but that on the right is overfat and has been spoilt by overfeeding. Both carcasses weigh 150lb.

One of the best ways of disposing of this surplus skimmed milk is to preserve it as curd for use later in the season when feed for the pigs is becoming scarcer. This can be done quite easily on any dairy farm without any elaborate apparatus. All that is required is a number of clean 40-gallon drums open at one end. The drums should be thoroughly washed with hot water and a detergent, well rinsed with clean, cold water, and then given a final rinse with a 1 per cent. formalin solution.

Surplus skimmed milk is put into a drum (it does not matter whether the drum is filled or not) and left until the curd has set and has attained a rubbery consistency. This stage has been reached when the curd, which, of course, forms on the top of the liquid, on being pulled slightly away from the side of the drum with the fingers, goes back into its original position after being released.

When the curd has reached this condition it should be broken up by stirring, after which it will sink to the bottom of the drum. The liquid or whey above the curd is either siphoned or bailed out until only 3in. to 4in. remains above the curd. The layer of whey seals the curd from the air. After this has been done for the first time more skimmed milk can be added to the partly filled drum and generally the curd that forms from this sinks to the bottom of its own accord. It may require stirring, but

PRESERVING CURD FOR PIGS

["New Zealand Farmer"

Left—When curd has reached a rubbery consistency it is ready for stirring. Right—Curd preserved in 40-gallon drums.

this is not likely. The resultant whey is again removed and the process continued until the drum is full. Full drums need not be covered, but should if possible be kept in a shady spot to avoid undue evaporation of the few inches of whey on top.

The liquor or whey that is removed during the process need not be wasted, as it can be fed to the pigs. If this is done, a slightly larger quantity of skimmed milk will be available for curd preservation.

This method enables quite small quantities of skimmed milk to be preserved as curd. The possession of only a few drums of this is invaluable in winter for feeding to early winter litters in the creep and also for putting the finishing touches on fattening pigs at the end of the dairying season.

In November and December litters of pigs farrowed the previous May are being finished off as baconers. If really high-class carcasses are to be obtained from them, the pigs must not become overfat. Feeding therefore must be restricted from the time the pigs reach 120lb. liveweight and the use of any food likely to taint the bacon should be discontinued during the last month of fattening. Surplus skimmed milk during this period can be most profitably preserved as curd with very little trouble. Preserving it as curd is much to be preferred to producing overfat carcasses.

Meteorological Records for August

Station	Height of station above M.S.L. (ft.)	Air temperatures in degrees (Fahrenheit)				Rainfall in inches					Bright sunshine hours
		Approx. mean	Difference from normal	Absolute maximum and minimum		Total fall	No. of days of rain	Difference from normal	Maximum fall		
				Maximum	Minimum				Amount	Date	
Kerikeri	201	52.6	+ 1.6	68.8	34.0	4.60	24	— 2.23	1.00	5	150.6
Auckland	160	54.2	+ 2.0	66.6	39.9	3.05	19	— 1.37	0.53	5	146.0
Tauranga	10	51.8	+ 2.1	64.7	33.8	4.78	19	+ 0.03	1.49	6	163.3
Ruakura	131	49.8	+ 2.0	66.1	25.7	3.83	22	— 0.26	0.65	8	134.2
Rotorua	975	48.6	+ 2.6	63.8	29.4	5.02	20	+ 0.12	1.40	6	123.3
Gisborne	12	51.4	+ 2.2	69.8	29.2	7.51	12	+ 3.65	2.56	1	161.1
New Plymouth ..	160	50.9	+ 1.3	66.0	38.0	6.09	24	+ 0.34	1.11	26	136.3
Kariol	2125	43.2	+ 1.2	59.0	22.7	5.37	20	+ 1.16	0.92	10	
Napier	5	51.8	+ 2.7	70.3	29.5	5.83	9	+ 2.90	1.93	30	146.9
Wanganui	72	51.4	+ 2.1	65.4	33.8	3.98	21	+ 1.03	0.76	26	127.0
Palmerston North .	110	50.3	+ 2.6	64.0	28.0	3.81	25	+ 0.06	0.45	10	107.2
Waingawa	340	48.7	+ 2.8	62.0	28.0	4.21	24	+ 0.03	0.84	29	130.3
Wellington	415	49.8	+ 2.0	58.5	37.4	6.82	21	+ 2.17	1.49	15	107.9
Nelson airfield ..	5	46.7	+ 1.9	61.4	31.7	5.93	19	+ 2.79	0.84	5	141.6
Blenheim	12	49.2	+ 2.9	66.0	29.0	2.61	16	+ 0.28	0.34	13	146.8
Hokitika	15	46.6	+ 1.9	57.9	32.1	10.57	24	+ 1.53	2.23	9	119.3
Hanmer	1270	43.8	+ 2.4	67.5	25.0	4.09	17	+ 0.51	0.83	2	122.9
Christchurch ..	22	46.6	+ 2.3	72.4	28.2	1.05	15	— 1.00	0.29	31	129.2
Ashburton	323	45.7	+ 2.0	72.0	27.2	1.09	12	— 1.23	0.38	5	126.0
Timaru	56	45.7	+ 1.9	72.8	31.3	1.11	8	— 0.35	0.50	5	113.2
Alexandra	520	42.2	+ 0.8	66.8	24.2	0.35	4	— 0.28	0.25	26	115.0
Taieri	80	44.5	+ 0.8	72.2	26.0	0.81	14	— 0.93	0.14	14	110.0
Invercargill airfield	0	43.0	+ 0.0	69.8	25.8	1.65	18	— 1.29	0.34	11	98.5

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Thinning the Stone Fruit Crop

ADEQUATE thinning of the crop is a major factor in the successful growing of peaches, apricots, nectarines, and to a less extent plums in order that fruit of a suitable size to meet the demands of the fresh fruit market or the cannery may be produced. In this article W. S. Kemp, Horticultural Instructor, Department of Agriculture, Alexandra, discusses points on thinning.

FOR thinning to be satisfactorily carried out it is necessary that the main objectives should be understood. These can be summarised as follows:—

1. To increase size, colour, and quality of the remaining fruits.

2. To prevent breakage of leaders and trees through overcropping.

3. To bring about more regular annual cropping.

4. To maintain tree vigour.

5. To facilitate control of disease and prevention of insect injury.

Most of the varieties of stone fruit which are important commercially are either self fruitful or are grown in conjunction with the necessary pollinators, and provided good weather conditions rule during the blossom period and bees are present in sufficient numbers, excessively heavy crops are usually set. If 10 per cent. of the blossoms set, that is all that is required with most stone fruits to produce a full crop of fruit. Thinning is usually necessary to bring about satisfactory size and quality in the crop.

Methods of Thinning

In New Zealand orchards practically all thinning of stone fruits is done by hand. There are other methods described later in this article which could perhaps be adopted with benefit.

As most kinds of stone fruit have short stems, thinning shears cannot be used as with pip fruits. Usually the fruit is grasped between the thumb and forefinger and given a sharp twist sideways or against the direction of growth. Little damage to spurs results from this method, as the fruit usually parts freely from the branch or lateral. With practice, thinning can be done rapidly and with a smooth and steady motion causing an almost continuous removal of fruit.

[*National Publicity*

To ensure that stone fruit of a satisfactory size and quality is harvested thinning of the crop is usually necessary.

Pole Thinning

Pole thinning can be carried out by two methods. In the first a fairly solid club is used which is long enough for the type of tree to be thinned. It has the end protected by rubber, often part of a tyre, and is used to knock the branches and shake off a proportion of the young fruits. The other more commonly used method is carried out with a lighter stick tipped with a piece of rubber hose. A 5ft. length of hoe handle inserted 6in. into an 18in. length of hose of preferably about 1¼in. has been found most satisfactory. This is used to break up clusters or remove single fruits where necessary. A further adaptation consists of a loop of V-shaped rubber belt which can be used for a similar purpose to the hose.

Research overseas has shown that the average time required for pole thinning was less than one-fifth of that for hand thinning, the use of ladders being greatly reduced by this method. In every case the number of fruits remaining on the club-thinned trees was greater, and these trees produced a slightly higher yield of somewhat smaller fruit. However, 97 per cent. of this fruit was of marketable size.

Chemical Thinning

Experiments in America have shown that blossom thinning sprays of dinitro ortho cresol or maleic hydrazide or the use of alpha naphthalene acetic acid about 5 weeks after full bloom give promise as thinning sprays on peaches. This work is still in the experimental stage and no recommendations can yet be made.

Types of Thinning

The optimum amount of fruit to be left on a tree can be determined by applying three main principles. It is of advantage to understand each of these, as in practice a combination of the three is usually adopted.

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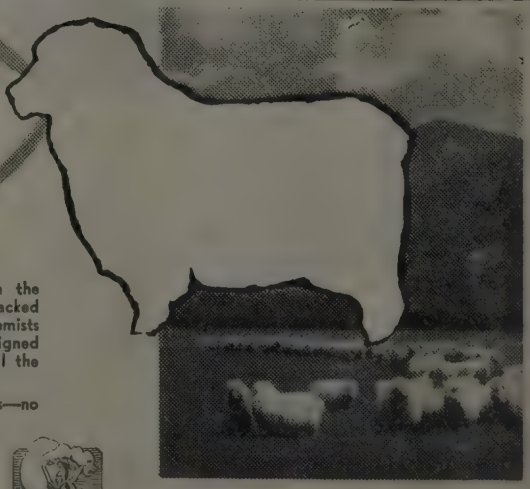

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Distance or Space Thinning

The principle of removing all fruits to a set distance apart is embodied in distance or space thinning, but is difficult to apply with accuracy. Selection of the spacing that will leave the right proportion of the crop on the tree is a problem. Because the type of shoot growth, the set of fruit, and the carrying capacity are so variable throughout the tree, the spacing will have to be varied accordingly and so no set rule can be laid down.

Fruit : Leaf Ratio

As a general rule the greater is the number of leaves on a tree the larger the size and the greater the sugar content of the fruit. Experimental evidence has shown that for peaches a ratio of 70 : 80 leaves per fruit gives the best results. Practically, however, this principle is difficult to apply with certainty, because the fruit : leaf ratio established at thinning time can be so easily upset by various happenings which may influence the later tree development.

Total Load

By the total load method the tree is thinned so as to adjust the crop to a load that the tree will be able to develop to a marketable size. It is necessary to take into account all known factors likely to affect fruit development such as age and condition of tree, as well as past productivity and the size of fruit desired. This method of thinning has been found to produce the best results, as the experienced grower can utilise his knowledge of individual trees to improve the productivity of his orchard.

Left—Moorpark apricots before thinning. Right—After thinning.

Only personal experience and a knowledge of the past performance of the orchard can enable the person thinning the crop to so regulate it that the number of fruits carried is within the ability of the trees to mature them to the desired size.

The amount of fruit which should remain on a tree after thinning has been carried out cannot be arbitrarily assessed, as there are so many factors influencing this point. Much depends on the vigour of individual trees, the kind and variety of fruit, cultural practices, and the market demand.

Overseas research on thinning peaches, particularly where the crop

[*R. W. Orr*

Left—Goldmine nectarines before thinning. Right—After thinning.

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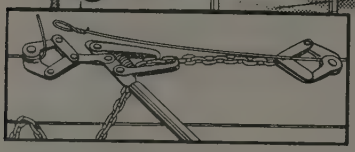
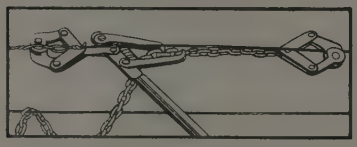
Chain Grab Wire Strainer



Grabs travel automatically up the chain, thus tightening the wire.



To make the knot, cut wire and form loop as shown in Fig. 1; slip other end through the loop, and finish knot over back left-hand grip as shown in Fig. 2. By knotting this way no slack wire is lost.

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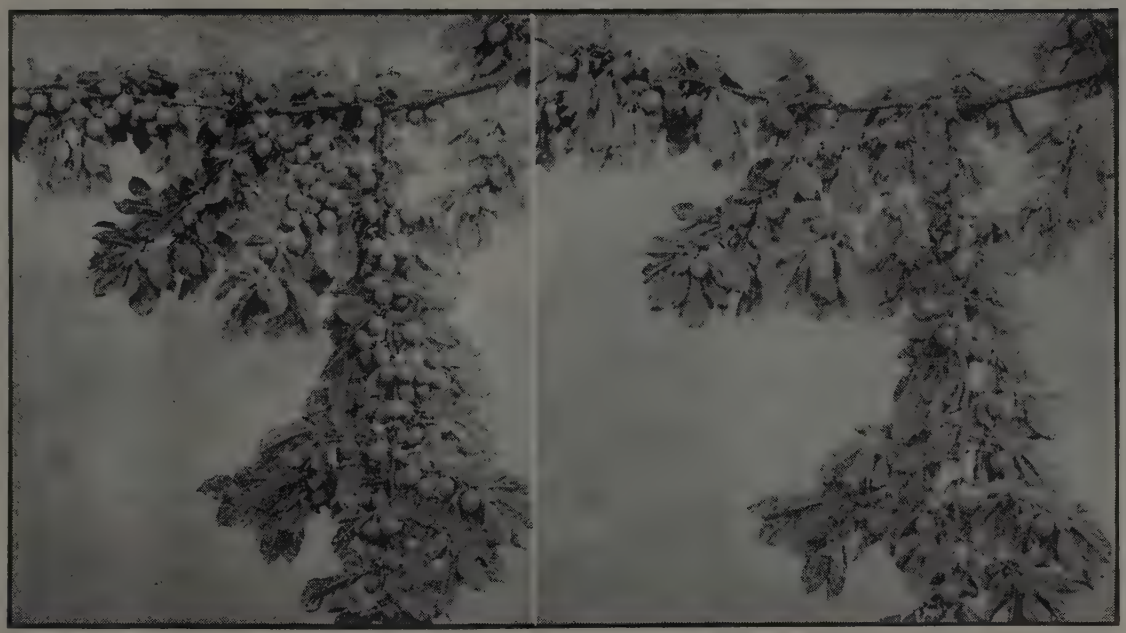


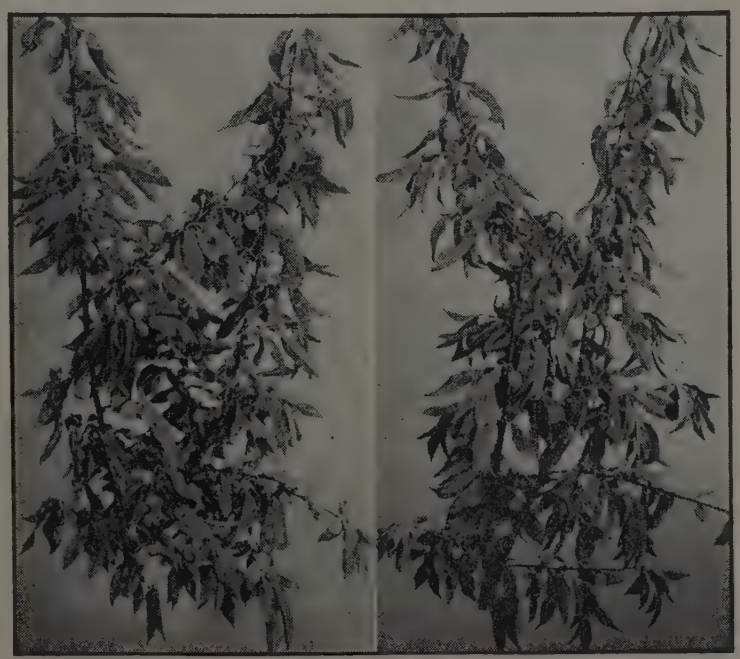
Left—Duff's Early Jewel plums before thinning. Right—After thinning. [*R. W. Orr*

is grown principally for canning, has shown that the maximum marketable crop results not from thinning so that all fruits on the tree are up to the minimum size desired, but when about 5 per cent. of the crop is under this figure, even though this part of the crop is unsaleable.

Time of Thinning

Though to obtain the greatest benefit thinning should be carried out as early as possible, this has to be qualified in practice. Stone fruits are subject to a natural shedding during spring which normally occurs in two or three waves over 6 to 10 weeks between petal fall and stone hardening. This factor, together with the climatic risk of damaging spring frosts in many districts, usually results in thinning operations being delayed until after the main drop has started or frost risk has passed. Generally thinning should be completed by the end of the stone hardening period, if the greatest possible benefit is to be obtained. Some benefit, however, will be obtained if thinning is carried out after this stage.

Kinds and varieties of stone fruits will usually be thinned in the order in which they mature; that is, those which mature first ordinarily will be thinned first. However, there are often exceptions to this. Varieties carrying heavy crops should be



[*R. W. Orr*

Left—Golden Queen peaches before thinning. Right—After thinning.

thinned before those carrying medium or light crops, even though they may mature later.

Points in Thinning

It is better to wait until the severity of the drop can be forecast. The proportion of fruit which is below average size or assuming a yellowish hue is a good index to the probable drop. Smaller than average fruits are unlikely to catch up in size with the larger fruits at maturity and should therefore be removed.

Fruit which is deformed, damaged by insects, or otherwise injured will retain defects, which will increase in size with the development of the fruit.

Fruits growing at or near the bases of laterals are usually larger than those growing near the tips. These latter fruits are also more prone to damage from limb rub and other causes.

The stronger and healthier tree growth is the greater is the amount of fruit that can be left on. On the other hand the weaker the tree or lateral is the less fruit it can carry.

The heavier is the set the sooner thinning should be commenced.

The main concern with thinning is the amount of fruit left on the tree and not the amount that has been removed. With a normal fruit set some kinds and varieties of stone fruits may require the removal of more than half the fruits on the tree if those left are to reach a good marketable size.

The amount of thinning done on any one tree or part of a tree should be related to the capacity of the wood to carry it. Regular space thinning is not important. If the fruit is distributed according to type of wood and capacity, the fruit size will be larger and more uniform and a higher average yield can be expected.

In coloured varieties fruit exposed to the sun will attain more colour than fruit growing in the shade. Early maturing varieties will require thinning first and usually need heavier thinning than later maturing ones in order to obtain good fruit size.

Demonstration Trees

It is a good plan for growers to select a number of trees of different kinds and types and thin these as models. Workers employed on thinning should then check with these trees from time to time if they have difficulty in adjusting their work to the pattern set. It is easy for workers to drift away from a standard unless occasional check backs are made.

Success of thinning depends largely on good judgment and a thorough knowledge of all the factors involved. Sound thinning technique is only one aspect of stone fruit production, though a highly important one. Much of the benefit to be derived from sound thinning practice can be lost if correct attention is not given to other orchard practices necessary for the production of satisfactory yields of good-quality fruit such as pruning, irrigation, manuring, and provision of adequate shelter.

Agricultural and Pastoral Show Dates

THE following are dates and venues of A. and P. shows up to the end of February:—

NORTH ISLAND

November

*4 and 5 November—Manawatu and West Coast A. and P. at Palmerston North.

5 November—Tokoroa A. and P. at Tokoroa.

*11 and 12 November—Wanganui A. and P. at Wanganui.

11 and 12 November—Whangarei A. and P. at Whangarei.

12 November—Clevedon A. and P. at Clevedon.

*18 and 19 November—Egmont A. and P. at Hawera.

19 November—Bay of Islands P. and I. at Waimate North.

19 November—Waihi A. and P. at Waihi.

24, 25, 26 November—Auckland A. and P. at Auckland.

*25 and 26 November—Stratford A. and P. at Stratford.

December

3 December—Hauraki A. and P. at Paeroa.

3 December—Kaikohe A., P., and H. at Kaikohe.

3 December—Helensville A. and P. at Helensville.

January

13 and 14 January—Wairoa County A. and P. at Wairoa.

20 and 21 January—Feilding I., A., and P. at Feilding.

21 January—Central Hawke's Bay A. and P. at Waipukurau.

*21 January—Whangaroa A. and P. at Kaeo.

27 and 28 January—Horowhenua A. and P. at Levin.

27 and 28 January—Rotorua A. and P. at Rotorua.

28 January—North Kaipara A. and P. at Paparoa.

*30 January—North Hokianga A. and P. at Broadwood.

February

1 February—Marton A. and P. at Marton.

3 and 4 February—Rodney A. and P. at Warkworth.

4 February—Rangitikei A. and P. at Taihape.

7 and 8 February—Dannevirke District A. and P. at Dannevirke.

10 February—Dannevirke Ram Fair at Dannevirke.

10 and 11 February—Taumarunui and District A. and P. at Taumarunui.

10 and 11 February—Taranaki A. and P. at New Plymouth.

11 February—Hukerenui A. and P. at Hukerenui.

11 February—Pahiatua A. and P. at Pahiatua.

*11 February—Galatea A. and P. at Galatea.

15 February—Te Awamutu A., P., and H. at Te Awamutu.

17 and 18 February—Ohura A., P., H., and I. at Nihoniho.

17 and 18 February—Franklin A. and P. at Pukekohe.

17 and 18 February—Masterton A. and P. at Masterton.

18 February—Northern Wairoa A. and P. at Mititai.

*18 February—Tauranga A. and P. at Tauranga.

*21 February—Otorohanga A. and P. at Otorohanga.

23 February—Matamata A. and P. at Matamata.

24 and 25 February—Wellington and Hutt Valley A. and P. at Trentham.

24 and 25 February—Te Kuiti and District A. and P. at Te Kuiti.

25 February—Te Puke A. and P. at Paengaroa.

25 February—Putaruru District A. and P. at Putaruru.

SOUTH ISLAND

November

3 November—Ashburton A. and P. at Ashburton.

*9, 10, and 11 November—Canterbury A. and P. at Christchurch (Royal Show).

16 November—North Otago A. and P. at Oamaru.

*18 and 19 November—Nelson A. and P. at Richmond.

19 November—Waimate A. and P. at Waimate.

19 November—Courtenay A. and P. at Kirwee.

19 November—West Otago A. and P. at Kelso.

19 November—Taieri A. and P. at Outram.

26 November—Motueka A. and P. at Motueka.

26 November—South Otago A. and P. at Balclutha.

December

*3 December—Winton A. and P. at Winton.

6 and 7 December—Gore A. and P. at Gore.

10 December—Otago Peninsula A. and P. at Portobello.

10 December—Wyndham A. and P. at Wyndham.

*13 and 14 December—Southland A. and P. at Invercargill.

17 December—Tokomairiro A. and P. at Milton.

January

14 January—Blueskin A. and P. at Waitati.

21 January—Peninsula H. and P. at Duvauchelle.

21 January—Waikouaiti A. and P. at Waikouaiti.

*21 January—Wallace A. and P. at Otautau.

28 January—Palmerston and Waihemo A. and P. at Palmerston.

28 January—Waiau A. and P. at Tuatapere.

February

2 and 3 February—Otago A. and P. at Dunedin.

*12 February—Inangahua A. and P. at Inangahua.

18 February—Banks Peninsula A. and P. at Little River.

18 February—Murchison A. and P. at Murchison.

*18 February—Central Otago A. and P. at Omakau.

*25 February—Kaikoura A. and P. at Kaikoura.

25 February—Maniototo A. and P. at Ranfurly.

* The Department of Agriculture exhibit will be staged at this show.

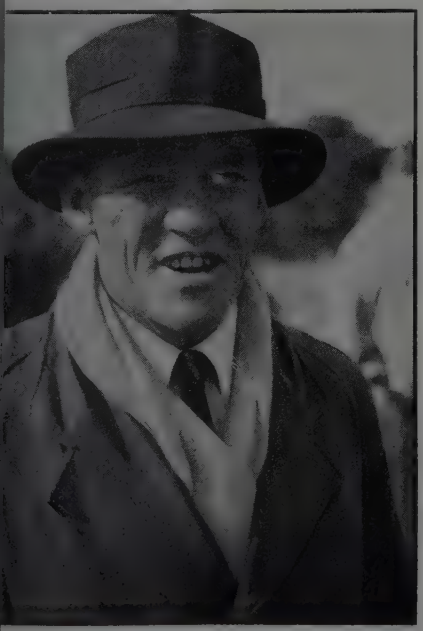
Use of Antibiotics on the Pig Farm

THE entry of antibiotics into animal husbandry in recent years has been accompanied by widespread publicity regarding the results farmers can expect from the use of antibiotics in disease prevention and as feed supplements. Research into the use of antibiotics on the pig farm that has been conducted at the Department of Agriculture's Ruakura Animal Research Station was summarised by D. M. Smith, Pig Research Officer at Ruakura, in a paper presented at this year's Ruakura Farmers' Conference, an adaptation of which follows.

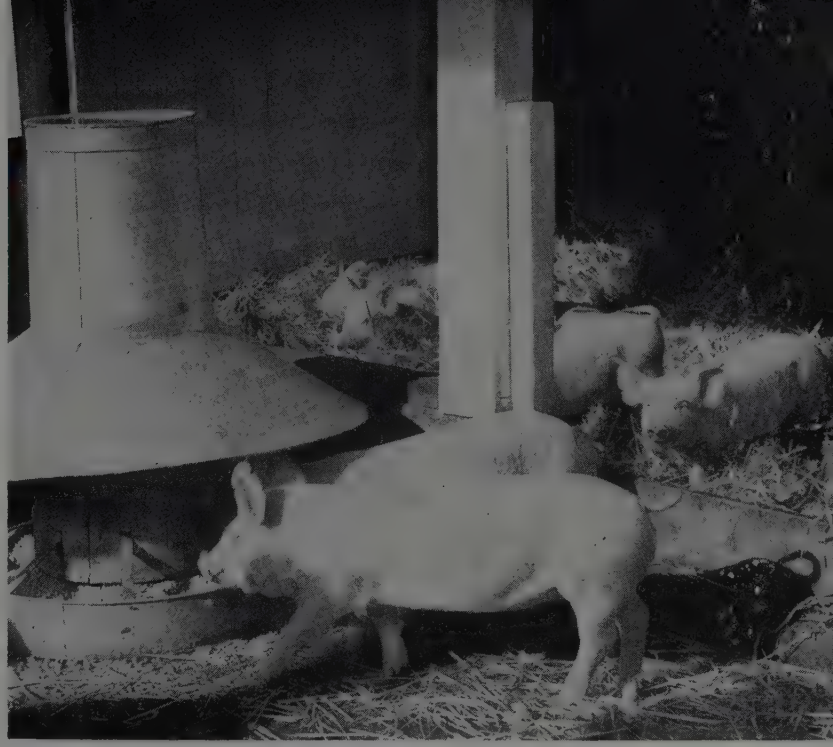
THERE are two methods of using antibiotics on the pig farm:—

1. As a treatment for specific infections such as arthritis, foot-rot, necrotic sores, pleurisy, and baby pig scours.

2. As a feed supplement to growing pigs in the creep feed or after weaning in the separated milk ration.



D. M. Smith, Pig Research Officer, Ruakura: Lack of capacity rather than lack of appetite stops a New Zealand pig, full fed on a bulky dilute food (separated milk), from eating more as the result of addition of antibiotics.



Early weaned pigs at the pig research centre at Ruakura Animal Research Station..

Treatment of Infections

As a treatment for specific infections antibiotics are extremely valuable, and from experience at Ruakura the following treatments can be recommended:—

Arthritis

Arthritis is a very common complaint with baby pigs, the usual symptoms being lameness and swollen hocks or knees. If the piglets are not treated, they may stop suckling, their hair stands on end, and they shiver and complain if forced to move. Sometimes a whole litter may die in 2 or 3 days.

At Ruakura all suckling pigs are examined daily. If a piglet is observed to be lame, it is injected with penicillin immediately. If, on examination the following day, an additional piglet is found to be lame, the whole litter is treated. By this method losses through arthritis have been almost eliminated. In older pigs arthritis of the shoulder or hip is quite common and can be controlled reasonably well by the use of penicillin.

This season at Ruakura a generous layer of wood shavings in the farrowing house is being tried and there have been no cases of arthritis in 14 litters. The main advantage from the use of shavings is the complete absence of abrasions on pigs' knees and hocks. When concrete or wooden floors are not adequately covered suckling pigs will wear their knees raw while suckling and this provides an entrance for the arthritis organisms. When the shavings become soiled or compacted another sackful is added. In other words, a short-term deep-litter system is being practised, and no cleaning out is done during the 8 weeks the piglets are on the sow. Obviously the use of shavings in the farrowing house as a means of reducing the incidence of arthritis is a better approach than the use of antibiotics to cure an established infection.

Foot-rot

Foot-rot is found in all districts in the North Island. If allowed to run its course, it results in swollen hooves, greatly swollen about the coronet, where the skin eventually breaks and pus and fluid discharge takes place. The pain arising from the infection causes the pig to stop feeding or makes it impossible for the pig to cope with competition at the trough. Affected animals lose weight and may eventually have to be marketed in poor condition.

If animals are treated when first lame, it is possible to effect a complete cure with intramuscular penicillin injections. As with arthritis it is essential to use antibiotic treatment at an early stage in the course of the infection.

However, a much better method of dealing with foot-rot is to prevent it altogether by putting pigs through a

copper sulphate and water foot bath systematically once a week from the beginning of September to the beginning of April. By use of this method of prevention at Ruakura foot-rot in fattening pigs has been eliminated. The foot bath is a preventive measure only and is of little or no use to a pig which is already lame.

Necrotic Sores

Necrotic sores can cause condemnation of carcasses and if severe can materially interfere with normal growth-rate. The use of penicillin injected into the skin surrounding the sore, the injection being repeated up to three times, can effect a complete cure.

Pleurisy

Pigs affected with pleurisy may die during fattening or be degraded at the time of slaughter because of the necessity of stripping the pleural membranes from the lining of the chest cavity. This renders the pig unsuitable as an export carcass.

The usual symptoms are loss of appetite and abdominal breathing. Treatment by injection in the early stages with suitable antibiotics usually effects a complete cure.

Baby Pig Scours

Severe setback in growth and even death can result from scouring in baby pigs. Scouring can start as early as 12 hours after birth, but seldom begins later than 3 weeks of age.

To date at Ruakura the best method of controlling these infections has been the use of aureomycin or terramycin. For easy dosing the tubes of material sold for udder injection have been used. A quantity is squeezed on to the tongue of the little pig in the same way as one would put toothpaste on a toothbrush. Again, the policy adopted at Ruakura is one of early dosing and semi-prevention. If one pig in the litter is scouring or unduly loose, the whole litter is dosed.

In the use of antibiotics for specific infections treatment when started early can materially help in reducing losses and rapidly returning affected animals to health.

Antibiotics in the Feed

The use of antibiotics in the feed is a very different matter from that used in treatment of infections, because there is nothing specific to combat. Briefly, from overseas work, antibiotic feed supplements are claimed to do five things:—

1. Increase feed consumption.
2. Increase growth-rate.
3. Increase feed conversion efficiency.
4. Combat gut infections.
5. Allow more extensive use of plant proteins.

Consideration of the validity of these claims under New Zealand conditions, with Ruakura experiments used as the basis for discussion, follows.

Under American conditions of pig keeping pigs are full fed on grain. Antibiotics added to grain have usually increased daily intake, most of the increases being substantial. When pigs are full fed on separated milk, that is, when there is milk available in the trough throughout the 24 hours, the addition of antibiotics does not increase intake.

This fact is readily explained by the difference in the nature of the feedstuffs used: In America, concentrated feeds such as grain; in New Zealand, a bulky dilute food, separated milk. Lack of capacity rather than lack of appetite stops a full-fed New Zealand pig from eating more as the result of addition of antibiotics.

Recommended Treatments

Arthritis

20,000 units of procaine penicillin per 10lb. of pig. 20,000 to 40,000 units is the normal dose.

Scours

½oz. tube of aureomycin per litter of ten pigs. For scours in piglets sulphamezathine is also used.

Necrotic Sores

The tubes are 300,000 to 500,000 units and these are sufficient for 2-day injections.

Pleurisy

500,000 units of a penicillin ester and streptomycin mixture.

Since a large proportion of the extra growth-rate observed in overseas experiments with antibiotics results from increased daily intake, the same spectacular results are unlikely to occur under the New Zealand feeding system.

Antibiotics in Creep Feeds

The use of antibiotics in creep feeds has been very widely recommended. In trials at Ruakura the effect of these supplements in creep feed has been measured. However, the milk production of the sows suckling the litters was also measured.

In some cases the pigs receiving antibiotic did eat more than those not receiving it. The level of the milk production of the sow was, however, much more important. Litters from sows whose milk production persisted at a high level ate less, irrespective of antibiotics, than litters of sows whose milk production fell rapidly after the third week of lactation.

However, there is some advantage in feeding antibiotics in the creep. If the piglets have meal available at all times, which is an essential of good creep management, intake can in some cases be improved, even though the average improvement is small. If the system of creep feeding used is that of giving a small feed of meal twice a day, the use of antibiotics is unlikely to produce any improvement.

If antibiotics are unlikely to improve growth-rate by increasing daily intake, the only remaining method is by increasing the efficiency of converting the milk that is eaten into meat. To test this claim experiments have been conducted at Ruakura and on farms. In fewer than half of the trials at Ruakura and on neither of the farm trials was there found to be any advantage in feeding aureomycin, penicillin, or streptomycin. In the few cases in which any improvement was found it consisted of a saving of 5 days in getting a 40lb. weaner to pork weight and a saving of 10 gallons of milk.

This means that if a farmer is efficiently using every gallon of milk produced each day, he will have 10 gallons extra available from each pig he fattens to pork. If, however, he is already overfeeding his pigs, he has 10 more gallons to embarrass him. Here again the difference in feeding methods between overseas countries and New Zealand has to be appreciated. If an American farmer saves 10lb. of corn on every pig fattened, that corn stays in the barn and can be fed 6 months later. In New Zealand the milk produced each day must be eaten within 24 hours. Since many farmers do not have sufficient pigs on hand to drink the milk available, any saving is of little advantage.

Replacement of Animal Protein

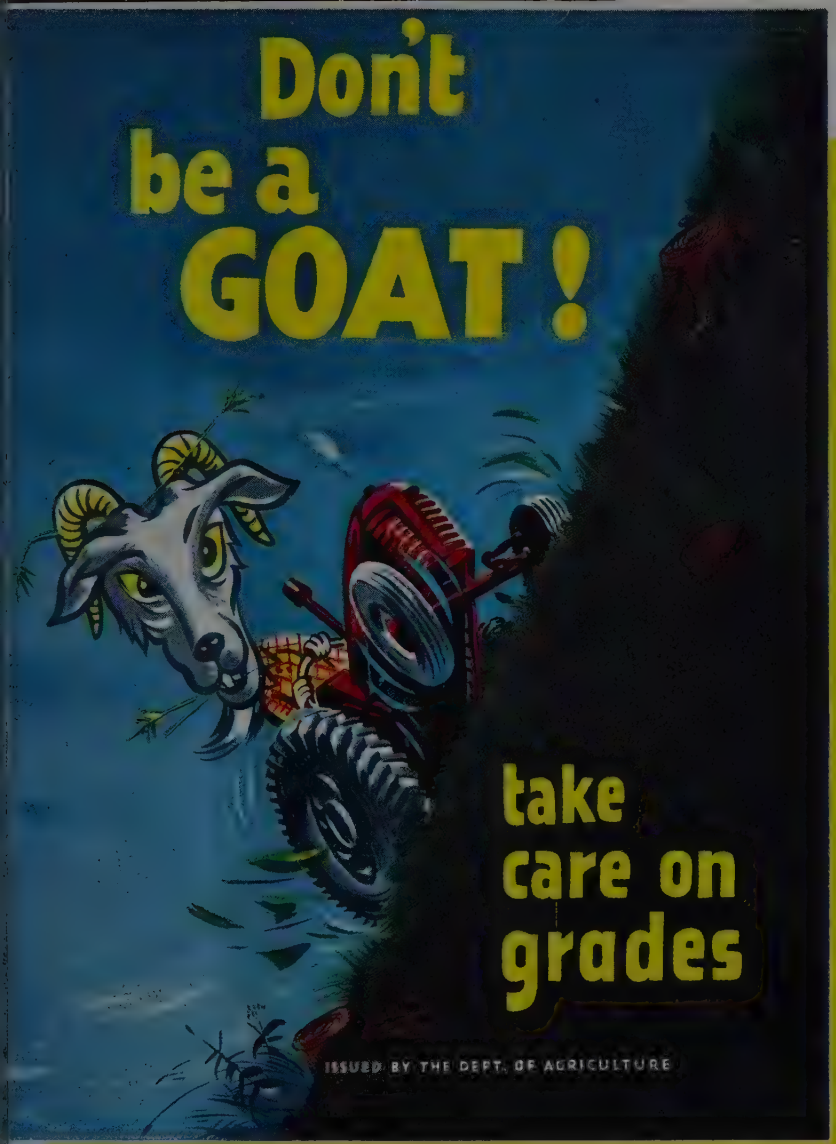
The claim that antibiotics enable the farmer to use cheap plant protein to replace more expensive animal protein in his feed mixture while still maintaining the growth-rate of his pigs is true under American conditions. There soy bean meal is rapidly replacing meat meal as a supplement to maize meal. In New Zealand the pig is already being fed three times as much animal protein as he requires; for this reason, this particular effect is not likely to be expressed under farming methods here.

Value of Antibiotics

For specific diseases and infections of pigs antibiotics are exceedingly valuable. In all cases early treatment produces the best results.

As a feed supplement antibiotics are sometimes useful in creep feeds, but the advantages will be evident only when the litter is provided with a continuous supply of meal while suckling. As a supplement to separated milk to fattening pigs antibiotics are of doubtful value. Where their use does result in increased efficiency and faster growth, only an already efficient feeder can reap the benefit under New Zealand conditions.

Photographs by Niederer.



14

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Scours
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Sheep

Blood Poisoning
Arthritis
Foot-rot
"Pink Eye" or Infectious Keratitis
Navel Ill
"Woody Tongue"—Actinomycosis

Pigs

Scours
Necrotic Sores
Pleurisy
Arthritis
Foot-rot

Horses

Strangles
Pneumonia
Fistula of the Withers
"Pink Eye" or Infectious Keratitis

Dogs

Pneumonia
Wound Infection
Otitis Externa
Conjunctivitis or Keratitis

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New Horticultural Pest Found on Nelson Tobacco

ADULTS of the moth *Prodenia litura* F. emerged on 15 March 1955 at the Entomological Research Station, Nelson, from caterpillars collected on tobacco at Riwaka and sent in for identification by Mr. R. Thomson, Director, Tobacco Research Station. This is the first record of the species breeding in this country. In some countries the insect is a serious pest of tobacco. In this article W. Cottier, Senior Entomologist, and E. S. Gourlay, Entomologist, both of the Entomological Research Station of the Department of Scientific and Industrial Research and the Cawthron Institute, Nelson, describe the various stages of the insect, its habits, and its methods of damage so that growers may recognise it.

THE caterpillars were found by Mr. R. Fry, Riwaka, on tobacco plants on his property. As soon as the moths were identified the Plant Quarantine Section of the Department of Agriculture was notified and a party carried out a preliminary inspection on Mr. Fry's property on 21 March. Approximately eight tobacco plants showed symptoms of having been attacked by the caterpillars, but Mr. Fry had taken such vigorous measures with D.D.T. that no more caterpillars were found.

During the period 23 to 30 March two officers of the Plant Quarantine Section made an intensive survey of the locality in which the insects were discovered and then inspected representative tobacco crops over the whole tobacco growing district. In all, the properties of 25 growers were inspected in Riwaka, Sandy Bay through Kaiteriteri Road, Riwaka Valley, Motueka, Motueka Valley, Thorpe, and Dovedale. No further definite evidence of the presence of *Prodenia* was found, though Mr. P. Beatson, of Ngatimoti, stated that about the middle of February he had noticed puncture marks on a leaf and on turning this over had seen more than 200 small, grey-green caterpillars on the under surface. Mr. Beatson immediately removed and burnt the plant and heavily dusted surrounding plants with D.D.T. This is thought to have been an occurrence of *Prodenia*.

Seedling beds are being surveyed this spring and in December field crops will be examined by Department of Agriculture officers. If the caterpillars are found again, it is intended to endeavour to eradicate them and this, to be successful, will require the co-operation of all growers. Therefore it will help the authorities greatly if growers will endeavour to familiarise themselves with the appearance of all stages of the pest and with symptoms of damage caused by it. Any suspicious damage should be reported to the organisations named at the end of this article. Insects associated with the damage should also be forwarded.

Upper—Moth of *Heliothis armigera*. Lower—Moth of *Prodenia litura*. (Both magnified two times.)

Stages and Habits of the Moth

The moth is rather handsome. It is approximately 1½in. across the outstretched wings (see illustration above). The fore wings are greyish brown with a pattern of light-coloured lines. The hind wings are almost white with an iridescent, pinkish tinge. The rear edges of the hind wings are white, and just inside the rear margin of each there is a very dark to almost black line. The moth lays its light-coloured eggs in masses (see illustration at right), as many as 300 eggs being present in one mass, according to overseas literature. It is characteristic that these egg masses are covered with an envelope of light brown to buff hairs from the bodies of the moths. The eggs may be laid on both surfaces of the leaves.

The caterpillars that hatch from the eggs are dark greenish to brownish with a conspicuous light band along the whole length of the body on each side. There is also a thinner pale line down the middle of the back and a similar one along the body between the conspicuous broader line along each side and the one along the middle of the back (see illustration overleaf).

Caterpillars when fully grown are approximately 1⅞in. long, but unfortunately all found at Riwaka were reared to moths and there are therefore no fully grown ones available for examination. The description given is drawn up from specimens kindly lent by the Plant Quarantine Section, Department of Agriculture, Wellington, which obtained them from Fiji. Unfortunately there are no fully grown caterpillars in the Fijian material, but the description fits all up to a length of §in. fairly well.

On hatching from the eggs the young caterpillars feed in a cluster in the immediate vicinity of the egg mass, and this habit has led to the insect being described as the "cluster-grub". This habit produces characteristic injury in the form of a group of numerous small holes in the leaf round each egg mass. The tissue between the veins is eaten, but the latter are left intact. The illustration on the following page shows a tobacco leaf so damaged, with the numerous small holes close together.

The older caterpillars lose this clustering habit and wander all over the plant. Early in the season the caterpillars may act as cutworms, eating through the stems of young plants close to the ground. Another habit

Egg mass of *Prodenia litura*, showing the matted covering of hairs and eggs exposed at top. (Magnified four times.)

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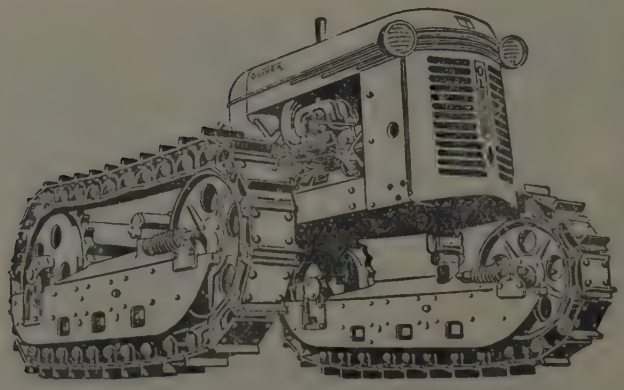

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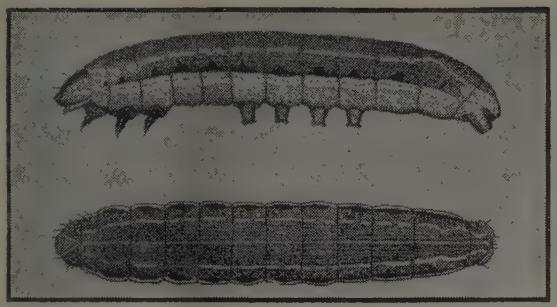


Immature caterpillars of *Prodenia litura*. Upper—View from side. Lower—View from above. (Magnified four times.)

the caterpillars are said to have overseas is the damaging of tobacco leaf hanging up in drying sheds. When fully grown the caterpillar leaves the plant and pupates in a cell in the ground as a dark brown chrysalis, and from this the moth emerges.

Life Cycle

In overseas countries eggs hatch in from 3 to 22 days, according to temperature. In warm regions such as India and Egypt the period is 4 to 9 days. In summer the caterpillar takes 2 to 4 weeks to reach maturity and the chrysalis stage occupies 1 to 2 weeks. The life cycle extends over 4 to 6 weeks in countries such as Egypt and India.

Distribution

The species occurs in tropical and sub-tropical countries all over the world; for example, India, Egypt, Fiji, New Caledonia, Java, Malaya, Spain, South Africa, and Formosa; also New South Wales, Japan, and Korea.

Food Plants in New Zealand

Food plants of the caterpillar that grow in New Zealand include tobacco, cabbage, cauliflower, radish, turnip, mustard, carrot, celery, lettuce, maize, marrow, pumpkin, passion fruit, tomato, egg plant, bean, pea, clover, lucerne, soy bean, potato, sweet potato, onion, shallot, violet, chilli, wheat, apple foliage, sunflower, begonia, mulberry, lantana, asparagus, rose, and poppy.

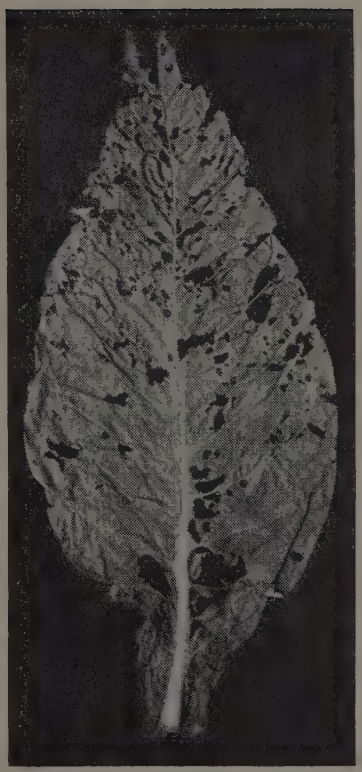
Another Caterpillar Pest on Tobacco

The only other large caterpillar commonly infesting tobacco is *Heliothis armigera*, commonly referred to on this host in some countries as tobacco bud-worm from its habit of feeding on the tops of flowering plants. This caterpillar varies greatly in colour from almost black to green, brown, and even pinkish. When fully grown the caterpillars are approximately 1½in. long and also show several longitudinal stripes on the body. With a hand lens it is possible to see that the skin is roughened by minute spikelets. A little practice is needed before this character can be seen clearly, but it is a satisfactory way to differentiate the caterpillars from those of *Prodenia*, in which the skin is smooth. The moth of *Heliothis* (see illustration on previous page) has fore wings of light brown with some dark cross markings, the hind wings being lighter but with broad dark bands on the apical portions and completely lacking the pinkish iridescence of *Prodenia*.

As noted above the caterpillars of the bud-worm feed mostly on the flower heads. They will hollow out the seed capsules or, in severe attacks, almost strip the heads. Leaves may show isolated large holes or pieces eaten out of the edges, symptoms that are quite different from the cluster of holes made in the leaves by caterpillars of *Prodenia*. The egg masses of this latter species are also sufficient to identify it, since *Heliothis* lays its almost spherical, white eggs singly and not in clusters.

The table below shows the differences between the two species.

Stage	*Prodenia litura*	*Heliothis armigera*
Eggs	Laid in a cluster, covered by envelope of brown to buff hairs from female	White, laid singly, and not covered
Caterpillars	Skin smooth. When young feed in a cluster to produce groups of perforations in leaves	Skin roughened with minute spikelets. Not feeding in clusters on leaves, but more often found on flower heads and in seed capsules
Moths	Fore wings greyish brown with pattern of light lines. Hind wings almost white with a conspicuous black line just within the rear margin of each. Hind wings show conspicuous pinkish iridescence	Fore wings light brown with dark cross markings. Hind wings lighter with large area of black on hind margin of each. Hind wings without iridescence



Tobacco leaf injured by *Prodenia litura*. Note the numerous small holes close together.

Though *Prodenia* is more common in countries with a warm climate, it seems possible that it might establish in New Zealand. Tobacco growers should keep a strict watch for it from the seed-bed stage onward and if any suspicious circumstances are noted, the Tobacco Research Station, Riwaka, the Entomological Research Station, Cawthron Institute, Nelson, or the Department of Agriculture should be notified immediately. It is earnestly hoped that all growers will co-operate in the search for this pest during the coming season.

It would also be appreciated if any suspicious damage and caterpillars on any other host plant are notified.

Acknowledgment

The authors are grateful to Mr. L. G. Morrison, Biologist, Horticulture Division, Department of Agriculture, for information concerning the survey carried out from 23 to 30 March.

All illustrations are by the Department of Scientific and Industrial Research.

First 25 Years

New Zealand Soil Bureau

CLIMATIC and soil conditions are the important factors influencing use of land. Both play a large part in deciding the success or otherwise of the type of farming practised in a particular area. Knowledge of soil types is the basis of much of the extension work to farmers in New Zealand and many of the marked advances in management techniques of recent years on the better farming areas and "problem" areas alike have arisen from the ever-increasing knowledge of fundamental soil properties that has become available in the 25 years of operation of the organisation now known as the New Zealand Soil Bureau. A short history of the origins, growth, and variety of work of the Bureau is contained in the following article by F. R. Callaghan, formerly Secretary of the Department of Scientific and Industrial Research, of which the Soil Bureau is a part.

ON 20 June 1930 the Prime Minister, the Rt. Hon. G. W. Forbes, as Minister in Charge of Scientific and Industrial Research announced that Cabinet had approved the formation of a Soil Reconnaissance Division of the Geological Survey Branch of the Department of Scientific and Industrial Research. This decision marked the bringing into being of what is known today as the Soil Bureau, the silver jubilee of the establishment of which falls in the present year.

The Council and Department of Scientific and Industrial Research had been for some time giving consideration to problems connected with soils, particularly those in the central part of the North Island where serious stock unthriftiness occurred. After some preliminary investigations it was felt that the Government should be recommended to embark on a more complete survey of the peculiar volcanic soil types.

As early as 1899 J. A. Pond and J. S. Maclaurin had investigated the soils of the Taupo Plains and the pastures growing on them. L. J. Wild had carried out a survey of the soils of the Wairau Plain and had published in the "Transactions of the New Zealand Institute" (volume 47, page 413) an article dealing with the various methods of soil survey suitable for New Zealand. B. C. Aston reported in the "Transactions of the New Zealand Institute" (volume 56, page 733) on the soils of Rotorua County and in addition had reported on certain smaller areas. The soils of Central Otago had been surveyed in 1926-27 by H. T. Ferrar and N. H. Taylor to guide the extensive irrigation work then proposed for that district.

Before 1930 the most complete soil survey was that of Waimea County, Nelson, in 1925-26 by T. Rigg, of the staff of the newly established Cawthron Institute. In this survey the most recent approved methods as adopted in the United Kingdom were used.

Reconnaissance of Volcanic Area

Rigg was chosen to supervise the reconnaissance survey which began in 1930 in the volcanic areas of the North Island by several officers of the Geological Survey Branch who had

Below—Data and soil samples gathered by the technical officer in the field are translated through the laboratory and the draughting room to information practically applied by the extension worker and the farmer.

already had experience of the problem in a series of investigations the year before in the King Country, Rotorua, and Taupo. L. I. Grange, who had recently completed a geological survey of the Rotorua-Taupo area, and N. H. Taylor, who had been associated with H. T. Ferrar in the Central Otago soil survey, had rapidly examined soil and geological conditions over a considerable portion of the Auckland Province and had formed the opinion that there existed a relationship between the soil and subsoil characters and the incidence of stock unthriftiness.

The chemical and physical examinations of the soil samples taken from the field by Grange and Taylor were to be done at Cawthron Institute under the direction of T. Rigg, who was assisted by A. R. Sim and L. Hodgson. Work began in August 1930. In August 1931 Miss E. B. Kidson was seconded from the Department of Scientific and Industrial Research to assist in this work. Dr. J. K. Dixon in November 1933 was placed in charge of the chemical work and had as his assistants during 1933-39 A. C. Harris, A. J. Metson, and J. T. Corder. F. T. Seelye of the Dominion Laboratory, Wellington, undertook the fusion analyses of samples collected in the field.

Reasons for Soil Reconnaissance

Toward the end of the 1920s a series of dark clouds was appearing on the horizon of New Zealand farming after the boom period following the First World War, when expansion of settlement into marginal areas had been accelerated. Hasty occupation of new country by men with scant farming experience and small capital, but often stout hearts and strong resolution, was beginning to show adverse results. Fern and scrub were beginning to invade bush-cleared areas on which grasses and clovers were being eaten out and then smothered by the advance of fern, gorse, blackberry, and ragwort.

N. H. Taylor, the present Director of the Soil Bureau.

A large and increasing area of the central portion of the North Island was described as coming within the class of deteriorated lands. Topdressing with superphosphate, though steadily advancing, was still limited and often restricted by bad access. "Bush sickness" still made farming impossible over hundreds of thousands of acres of land of easy terrain in the Auckland Province. For this there was yet no effective remedy, though B. C. Aston's pioneering discovery that the disease was caused by a deficiency and not by the presence of a toxic substance represented distinct progress in the attack on a problem that for years had baffled all who had endeavoured to solve it. Aston considered from analyses of the pastures grazed by stock which developed bush sickness that the deficiency was iron, and showed that by the use of drenches of ferric ammonium citrate and of limonite licks the disease could be checked.

But these methods were not altogether satisfactory in farm practice and so farmers in affected areas were abandoning their holdings and walking off penniless. To investigate bush sickness the Department of Agriculture had bought a farm at Mamaku where endeavours over the years had failed to provide a solution.

Dr. L. I. Grange, the first Director of the Soil Bureau.

Widespread Stock Unthriftiness

The outlook was worsened by reports of various types of stock unthriftiness occurring sporadically throughout the whole country. Dopiness occurred at Mairoa in the King Country, Morton Mains disease appeared in Southland, *Xanthene calculi* affected sheep in Nelson, and in a host of other places farmers noted types of unthriftiness which applications of phosphates and lime failed to remedy. Even overseas these threats to the world's agriculture and food supplies were recognised as serious and in 1929 the Empire Marketing Board had made grants available to the New Zealand Council of Scientific and Industrial Research for investigations into the control of noxious weeds and for studies of the mineral content of pastures. Already, too, the economic difficulties of the depression were casting their first shadows across the New Zealand scene. The new strains of improved pasture plants had not been developed, nor had any advances been made in that very important sphere known today as pasture management.

Sir Theodore Rigg, the first director of the soil reconnaissance scheme.

Such is an incomplete picture of the times in which the Soil Reconnaissance Division was established. Interest tended to be focused first in the King Country and particularly at Te Kuiti. The local Member of Parliament, Mr. W. J. Broadfoot, always took a live practical interest in soil problems and C. M. Wright of the Department of Agriculture, which was endeavouring to promote land settlement in the King Country, gave the investigations centring in Te Kuiti very valuable support. The locality showed up in sharp relief various types of unthriftiness in stock because, as was soon shown, it was influenced by various ash showers whose margins overlapped in the area embraced by such districts as Kopaki, Mairoa, and Ngaroma.

New Approach to Soil Studies

In 1930-31 Grange and Taylor studied this area closely and the first reconnaissance map showing the approximate boundaries of eight volcanic showers originating from the

Above—Headquarters of the Soil Bureau at Wellington since 1940. Below—The future home of the Soil Bureau at Taita in the Hutt Valley, near Wellington, showing temporary accommodation. Fundamental problems relating to hill country soils will be studied on the 200 acres (approximately) at this station. Some of the hill country can be seen in the background.

Rotorua-Taupo-Ruapehu region was issued. Taylor, on Nash's farm at Mairoa, studied the influence of types of surface vegetation on the profiles of the soils on which they grew and recognised characters which enabled him to interpret from these profiles their previous history. This new approach to soil studies was stimulated by a translation of the work of the Russian soil scientist Glinka which reached New Zealand about this time and has since been adopted as the standard approach to soil classification.

While the work was centred at Te Kuiti a good deal of critical investigation was done and valuable experience gained in problems concerning interpretation of soils formed from various showers and of soil and subsoil relationships. Mairoa soils had been shown to be phosphate deficient. Use of phosphatic fertilisers and the wider use of lime did much to re-establish profitable farming in the area west of the Main Trunk railway line, where after the initial fertility arising from bush burns had been used up farming had met serious reverses.

Now that it had been shown to be possible by soil surveys to interpret areas liable to bush sickness Grange and Taylor's services were in regular demand in 1931-32 for examination and reports on blocks of land in which the Native and Lands and Survey Departments were interested. The Hon. A. T. Ngata, Minister of Native Affairs, was promoting with great vigour a policy of land settlement and had asked for soil survey reports on seven areas. Districts such as Ngaroma, where farming was evidently not proving a success, and the Galatea Estate, east of Rotorua, which was under offer for closer settlement, were surveyed in this period. Galatea had many peculiar features and presented a difficult problem to Grange and Taylor in their assessment of its soils.

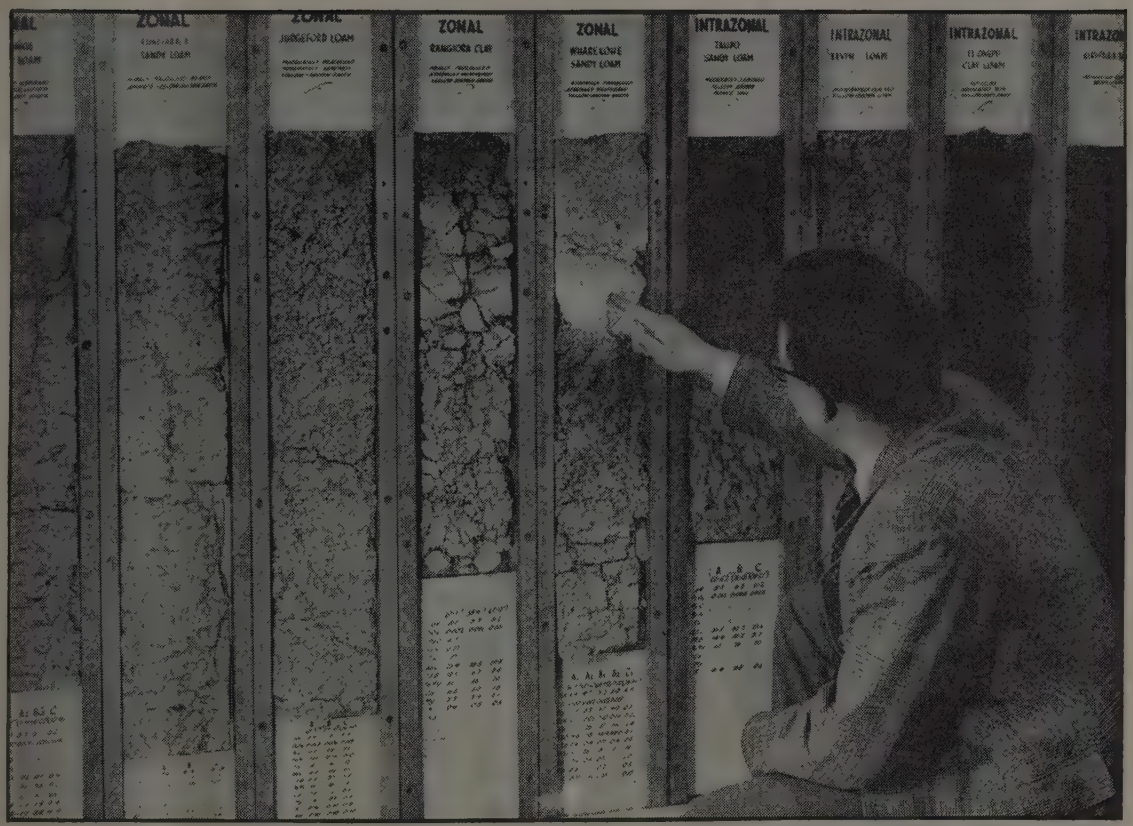
Difficult Days

By 1932 appeared the first signs of difficult days ahead for the Soil Reconnaissance Division, as the onset of the depression was tending to slow down land development and hence the need for surveys and reports of further blocks of land. Requests for such help from the Native and Lands Departments tapered off and so new avenues had to be searched for and, when found, justified and this was not an easy task in times of straitened finances. Sir Apirana Ngata's vigorous development policy had ended.

At this stage Dr. Marsden's appeal for outside assistance for soil reconnaissance work had been generously responded to by private firms. The Empire Marketing Board had agreed also to some of its grant originally made for investigation of mineral contents of pastures being used for soil reconnaissance.

Expenditure in the early years of the Soil Reconnaissance Division was on an extremely modest scale. In 1932-33, the third year of its existence, it totalled £1241.

Toward the end of 1932 it became obvious that a change was imminent and a new line of activity had to be sought. The idea of a soil survey of the whole of New Zealand had been



New Zealand soils vary greatly. Some examples of soil profiles are shown here.

given thought, but the times seemed inopportune for putting this idea into effect.

In Taranaki there had long been active interest in the different responses which soils in north and south Taranaki respectively had given to superphosphate and to basic slag. This district provided one of those instances where manurial responses to different types of phosphate were very marked, and this was of continued interest to farmers and fertiliser manufacturers and appeared to justify an examination of the soils to see if the different manurial reactions could be explained. A rapid reconnaissance survey of Taranaki was done and maps showing in broad outline the existing soil types were printed.

Surveys for Irrigation

In the South Island, with the return of T. G. Beck from the U.S.A., the Public Works Department had started on a programme of irrigation. The downs of Levels County were first provided with a piped water supply for stock and then attention was devoted to an irrigation scheme for the plains portion of the county. A scheme for the Redcliff district of Waitaki County followed. Ultimately the programme extended northward and embraced the whole of Ashburton County.

Beck required soil information for all of his irrigation projects and consequently soil surveys of various types were prepared for the Levels, Redcliff, and Ashburton County schemes. A reconnaissance survey was carried out of the whole of Ashburton County by Grange and later, with the help of a grant from the Unemployment Board, Dr. Weston of Lincoln College allocated two of his students, Wilkie and Fleming, to undertake crop and farm management surveys of the county which could be superimposed on the soil map and used to consider further development of its soil resources.

In 1932 the influence of the depression was making itself felt in many ways and the continuance of the Soil Reconnaissance Division was at stake. In March 1932 Dr. Marsden had to seek Mr. Forbes's consent to its continuance for a further 3 months. Fortunately the order to close down was avoided and the Ashburton, Taranaki, and Waikato surveys continued on a very hesitating and restrictive scale.

About this time the idea of organising a proper soil survey of New Zealand again came up for consideration. The experience already gained by both the field teams and the laboratory staff was very valuable, but it was obvious that if a full-scale soil survey of the Dominion was proposed close attention to the basic features of such an ambitious scheme was essential. It was recognised that reconnaissance surveys, because they were designed to serve specific purposes of the moment in districts widely scattered throughout the

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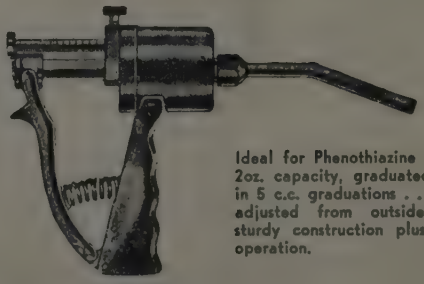

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country, were not the type of activity which would provide a good basis for a national soil survey. Much attention to methods, technique, and soil principles was necessary, especially with soils which had a number of unique features which would present new problems in classification and concerning which little or no guidance could be secured from overseas.

Waipa Survey

A wide range of soil types was known to exist in the Waikato district. Portions of it had been settled for a long time and topdressing on a wide scale had originated there. Some years previously P. W. Smallfield, then district Agricultural Instructor, had examined the farming of Waipa County, a very typical Waikato county, and had given his findings in articles in "The New Zealand Journal of Agriculture". Smallfield was known to be sympathetic toward the idea of soil surveys and indeed both at this time and since has given them every encouragement.

Waipa County was therefore selected for a special study, which could be justified on many grounds, not the least being that it was a county which had for long been topdressed, and an immediate question was whether the soils showed any justification for continuation of the practice. What was more important was that Waipa County was a suitable area on which to work out the basic features of a soil survey for the whole of New Zealand. The soil survey of Waipa County took about 2 years, but it was time that was very well spent, as it provided knowledge which enabled the principles established to be rapidly extended over wide areas and thus saved time and mistakes in the long run. Moreover, the survey was not very costly, and just how much this meant in the depression years may be difficult to realise. When the Waipa County survey was in progress the Department of Scientific and Industrial Research's appropriation to soil survey was £1260, of which almost £400 was provided by receipts from interested firms.

In 1933 T. Rigg reported to the Council of Scientific and Industrial Research on the progress of the Taranaki and Waipa surveys. He felt that reconnaissance methods had shown that it was possible to relate stock unthriftiness to the Taupo and Kaharoa ash shower soils, and consequently that it was possible by soil inspection and chemical examination to advise those concerned where stock sickness could be expected, and that the objectives for which the Soil Reconnaissance Division was originally established had been attained. He therefore asked to be relieved of his duties as Director and the Council agreed to this in September 1933.

Dr. J. Henderson, Director of the Geological Survey, found having a soil survey division attached to his branch inconvenient and so in October 1933 the Council and Department of Scientific and Industrial Research formed a Soil Survey Section, L. I. Grange being appointed Officer-in-Charge. Collaboration with Cawthron Institute was continued, the chemical work for the survey section being continued there under the direction of T. Rigg. Dr. J. K. Dixon joined the staff in November 1933 and investigations at Cawthron on the nature and cause of bush sickness were intensified.

In the depression years funds for anything other than projects which provided immediate relief of the current widespread distress were difficult to obtain. Anything of a long-range nature could not be attempted and a soil survey of the whole of New Zealand definitely came into this category.

To substantiate a convincing case for soil survey on utilitarian grounds was difficult. It could not be claimed

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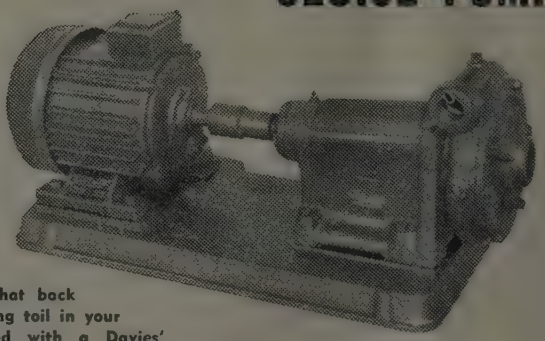

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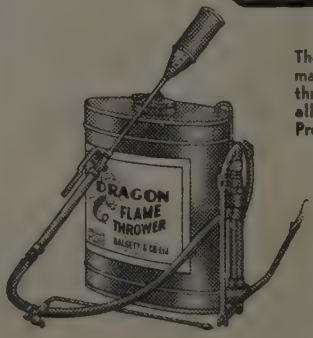

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that the soil surveys of Waimea and Takaka Counties were being used advantageously by Nelson farmers. Soil surveys made in Britain, the U.S.A., and Australia did not provide convincing evidence that the agriculture of these countries had derived benefit from such efforts. Certainly a few benefits were apparent where the surveys had been done for specific purposes such as irrigation, but for the most part farming practices and the use of land for various purposes had been evolved by trial and error.

Land Utilisation Surveys

To overcome these very real objections and to give point to soil surveys as having great importance in New Zealand pastoral farming, the idea of land utilisation surveys was developed. In a land utilisation survey there were three main sections: Survey of soils; survey of pastures; and survey of farm management. These three sections would be integrated and when the surveys were completed they would be written up in association so that the final report would be of use to the district agricultural instructors or to others interested. On such a basis the information available would be useful in developing agriculture or horticulture on any particular holding included in the survey. The information and conclusions would also prove useful for regional developments and at this period (1930 onward) regional development was a live political issue for which an organisation had been established.

Fortunately, in 1934 the Unemployment Board and the regional planning authorities were very interested in developing North Auckland for dairying and citriculture. In Hawke's Bay a development council had been formed in the hope originally of locating in the province oil and mineral resources which might be developed, but when the council was assured that none existed it gladly turned its attention to local soil resources.

The Council of Scientific and Industrial Research established a land utilisation committee with Sir Theodore Rigg as its chairman and representatives of the Departments of Agriculture, Lands and Survey, and Industries and Commerce, and of Massey and Lincoln Agricultural Colleges. With the help of funds provided by the Hawke's Bay Development Council, fertiliser companies,

and the Unemployment Board regional surveys were begun in Hawke's Bay and North Auckland, N. H. Taylor being located in Whangarei and L. I. Grange in Hastings.

In Hawke's Bay a special group from the Department of Agriculture, I. L. Elliott, P. R. Barrer, and J. P. Beggs, under the direction of R. P. Connell, undertook the farm management survey, and E. A. Madden of the Grasslands Division proceeded with a pasture survey, J. D. Atkinson with an orchard survey, and W. C. Hyde with a survey of market gardening. R. E. R. Grimmett dealt with the saline soils which the earthquake of 1931 had raised above sea level near Napier. The Hawke's Bay survey continued until 1939 and the Heretaunga Plains portion of the province, where intensive farming was practised, was done in greater detail than in any survey previously attempted.

In North Auckland the survey was not developed on the same land utilisation lines as that of Hawke's Bay. The former district, because of the extraordinary variety of its soils (many of them only partially developed and many "problem" soils), and because the view was widely held that the area offered one of the greatest and readiest potentialities for speedy development, provided of itself sufficient justification for soil survey. There was, furthermore, a strong local recognition of the significance of the different soils occurring there and which were presenting a challenge to those developing them. Soils were a very live interest locally and this was made abundantly clear by the number of problems which were brought to N. H. Taylor's office in Whangarei.

Turning Point

The years 1934-35 represented a turning point in the history of soil surveys in New Zealand and the stalemate and uncertainties of the depression appeared to be passing. It became possible to employ more staff. C. F. Sutherland joined N. H. Taylor in Whangarei. I. J. Pohlen, A. M. Quennell, H. A. Hughes, H. S. Gibbs, C. S. Harris, and J. D. Raeside all participated in the Hawke's Bay surveys. K. S. Birrell from the Public Works Department joined Dr. J. K. Dixon in work associated with the Redcliff, Levels, and Ashburton irrigation areas.

In 1935 Filmer and Underwood reported their discovery of the efficacy of cobalt to control a deficiency disease of sheep and cattle in Western Australia which showed symptoms closely resembling bush sickness. New Zealand scientists who had for some years been investigating bush sickness intensively and appeared to be almost on the eve of a solution soon verified the Australian discovery locally and, within a very short period, cobaltised superphosphate was available for topdressing and bush sickness no longer held the terrors for farming that it formerly did.

During 1934-39, though the North Auckland and the Hawke's Bay surveys ranked as the major projects, a number of interesting side issues claimed attention. The decline in the timber and mining industries on the west coast of the South Island raised questions regarding the conversion of the large areas of pakihi soils to agricultural use and C. S. Harris mapped these, particularly near Westport.

The housing policy of the Labour Government involved the purchase of much suburban market garden land for housing, particularly in the Hutt Valley, and in Avondale and Panmure in Auckland. The Soil Survey Section was asked to examine soils in other localities which could be used for vegetable growing to replace those to be converted to housing. C. S. Harris was closely associated with this work in the Manawatu, Ohakune, and Christchurch and he also surveyed the Wairau Plain in Marlborough for its irrigation possibilities.

Phormium and Tung Oil

The *Phormium tenax* industry was one which the Government was anxious to promote and to rescue from its deterioration. The areas of phormium were showing a strong decreasing trend, owing to the ravages of yellow leaf disease and use of flax land for other purposes. N. H. Taylor was asked to investigate whether soil characters had any relation to the incidence of disease and of indicating areas where phormium culture could be established successfully. The purchase of the Moutoa Estate by the Government as a phormium development project required careful examination of the soil types formed by the Manawatu River near Foxton.

In North Auckland tung oil interests had planted considerable areas in oil-bearing trees, but these failed to thrive and serious financial losses faced those who had embarked too hastily on this venture. N. H. Taylor and M. M. Burns (who had recently returned to New Zealand from the U.S.A., where he had investigated tung oil plantations) were asked to carry out a survey of the existing New Zealand plantations and provide a report on their prospects of success. Their conclusions were unfavourable.

On Banks Peninsula seed yields of cocksfoot pastures were gradually failing and were approaching the unprofitable level, and an examination of the distinctive volcanic and loess soils on which this crop was grown was sought. C. S. Harris surveyed the Wainui area on the western side of Akaroa Harbour and his map of soil types and arrangement could be interpreted over any part of Banks Peninsula.

Matakaoa County in the Gisborne Land District found itself in financial straits owing to the deterioration that succeeded the period of prosperity after the bush was cleared on the original settled land. Isolation and costs of transport were also serious handicaps. The Internal Affairs Department decided on a complete review of the county's prospects and H. S. Gibbs surveyed its soils and E. A. Madden its pastures and plant cover.

North Island Survey

By about 1939-40 it again became possible to consider a general soil survey of the North Island and plans were prepared for dealing with a task of much greater magnitude than any previously attempted. L. I. Grange, who had been appointed Director of the Soil Survey Division, Department of Scientific and Industrial Research, in 1937, found increasing difficulty in administering his division when the soil chemistry staff were at Cawthron Institute, Nelson, so in 1939, after negotiations with Sir Theodore Rigg, Director of the Institute, it was decided to transfer the chemical work to Wellington. Dr. J. K. Dixon and A. J. Metson came to Wellington and close collaboration was continued with Cawthron Institute by a written agreement defining spheres of activity and other relevant matters. Miss E. B. Kidson remained at Cawthron Institute.

The outbreak of the Second World War in 1939 seriously interrupted the programme planned, but brought to the fore a series of other problems which demanded more urgent attention. However, it was found possible to continue the North Island general survey and to begin a survey of soil erosion in mountain areas of the South Island, by H. S. Gibbs and J. D. Raeside. Interest in soil erosion and soil conservation had developed markedly immediately before the Second World War. The Government passed some far-reaching legislation, established a Soil Conservation and Rivers Control Council, and pressed on with measures to deal with soil erosion problems throughout New Zealand. In the South Island alpine regions erosion appeared most extensive and its assessment took some years to complete.

Wartime Projects

Wartime projects in which the Soil Survey Division was concerned were very diverse. The Government's response to the United Kingdom Government's appeal to produce linen flax fibre involved the establishment of a new industry, and areas of soils suitable for the growth of linen flax had to be found. Further soil investigations were continually necessary to explain anomalies which are bound to appear when a new crop is grown

extensively. Throughout the war and afterward areas in Marlborough, Canterbury, Otago, and Southland were surveyed and tested constantly because of linen flax problems.

The question of New Zealand growing sugar beet to provide its extensive sugar requirements also arose at this time and the division reported on a series of soil types in Canterbury that were considered suitable for this crop, but owing to the considerable capital cost involved in the establishment of a factory and to other uncertainties the proposal was dropped.

Tobacco Growing Problems

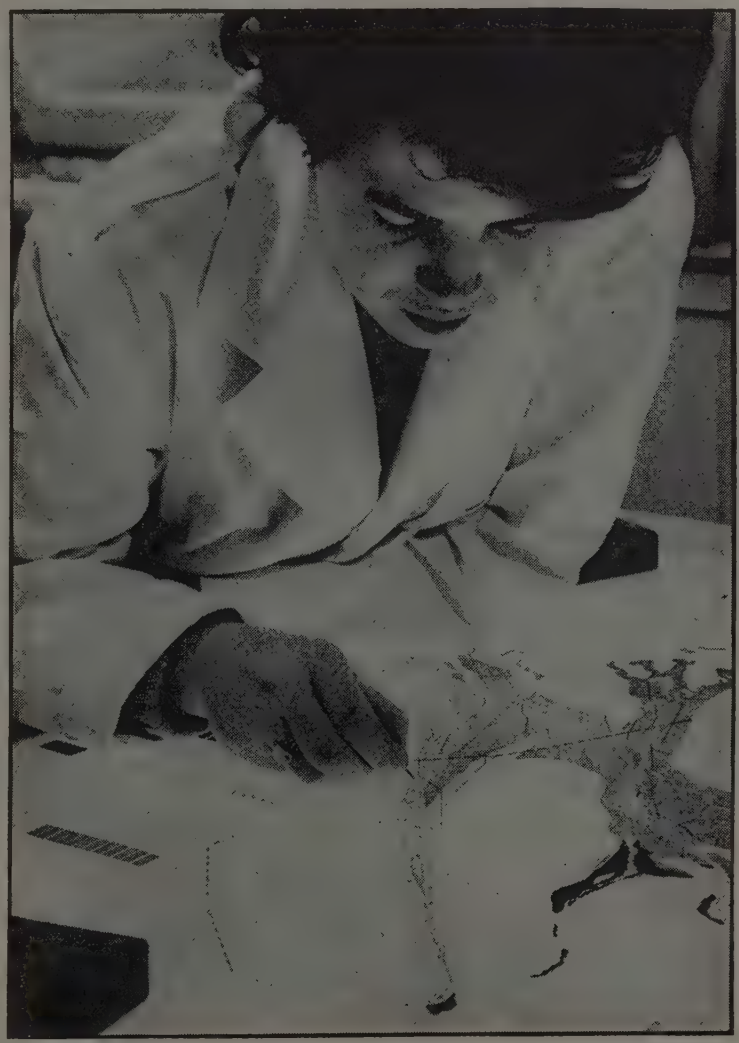
In 1930-31 the tobacco industry in New Zealand ran into difficulties with the attempt to grow the crop on a commercial scale at Riverhead (Auckland), Pongakawa (Bay of Plenty), Napier, and Motueka and other parts of Nelson. As tobacco is very sensitive to the soil on which it is grown and also to climate, N. H. Taylor carried out a survey of the possible areas on which it might be grown successfully and concluded that the Motueka Valley held most promise.

This finding has been justified since by the success of the industry at Motueka and other nearby localities. The detailed surveys of the Nelson tobacco areas, the fertiliser trials, and the association of the results of this work with the farm practices of tobacco growing, all of which have been done by Sir Theodore Rigg and his staff at Cawthron Institute, have revealed how valuable soil surveys and soil science can be in ensuring a successful tobacco industry.

Wartime demands for soil surfaces satisfactory for aerodromes and for road surfacing using a minimum of cement brought into prominence the need for work relating to soil mechanics and K. S. Birrell had to engage on considerable original research on the physical properties of a wide range of soils and subsoil materials.

In 1942 pot culture work was instituted and tried extensively as a means for assessing rapidly the response of different types of soils to various manurial applications and physical treatments. This work was later to become the nucleus of the Biotics Division, established in 1947. In more recent years this has been added to by sections dealing with microbiology, protozoa, earthworms, and soil biochemistry.

Dental caries and its prevention by the use of fluorine called for an examination of the fluorine content of New Zealand soils in 1943 and this brought the association between soils and the health of human beings to the fore. In the Pacific Islands garrisoned by New Zealand troops the problem of growing fresh vegetables became serious and numerous soils collected from the islands were examined and advice on the growing of vegetables by hydroponics was provided.



Information gathered from the field and laboratory enables the soil scientist to classify the soil. The draughting section of the Soil Bureau draws the maps showing the boundaries of the various soil types.

North Island Survey Completed

By 1949 the general survey of the North Island had been completed and written up for publication and in the following year the legend for the South Island maps was completed. In 1954 the complete report and maps of the North Island were published and thus in 15 years there was recorded a detailed picture of the soil resources of an area of 44,294 square miles in which the greatest diversity of unusual soil types occurred.

Since the end of the Second World War an ever-widening range of soil problems has been referred to the Soil Bureau, the designation of the soil survey organisation since 1946. Erosion problems of Marlborough and many North Island districts were dealt with. Soil surveys of the Cook Islands, Niue, and Fiji were undertaken. Soil-plant relationships have been examined with the aid of radioactive phosphorus, soil corrosion affecting underground water supply pipes has been investigated in a number of localities, including Hastings and Thames, and the bearing strengths of subsoils on

which major constructions were proposed have been determined. Investigations have been made in relation to earth dams for water reservoirs constructed in many localities.

The composting of city garbage has been investigated and guidance on this subject provided to the municipalities of Dannevirke and Auckland. Deficiency problems relating to boron, copper, molybdenum, zinc, and manganese have been a constant subject of study in many districts. The range of varieties of earthworms found in New Zealand and their influence on soil characters have been studied exhaustively and their economic significance determined. Problems of soil erosion in the fruit growing areas of the Heathcote Valley and in the valley of the Waipaoa River have been given close attention. The use of the deteriorated soils of the Glen Ledi district of South Otago for forestry and of the Himatangi sand dune areas and the Kerikeri ironstone soils for improved farming has been investigated.

Fundamental research using indicator plants such as sweet vernal to reveal the available minerals in different soils, biological effects on soils of the change from native to sown pastures, determination of the age of the pumice showers by examination of the radioactive carbon content of timber fragments, and investigations of the clay mineral fractions of soils have been included in the programme of the Soil Bureau.

In 1952 Dr. L. I. Grange resigned as Director to return to the Geological Survey as Director. He was succeeded by N. H. Taylor, and Dr. J. K. Dixon became Assistant Director.

Achievements

During the lifetime of the Soil Bureau a revolution has occurred in thought and attitude toward soil surveys and soil science. In large measure this can be attributed to the efforts of the staff, who have shown the very great practical advantages which can be derived from a scientific investigation of the soil. Much of New Zealand is rough, hilly, or mountainous and the area of easy country is relatively small. Over almost the whole country the soil is shallow. For these and other reasons it is essential that to maintain a good standard of production without mining what may be termed the rather thin soil resources careful scientific investigations and surveys are necessary.

The achievements of the Soil Bureau in the first quarter century of its existence have been remarkable, but the work is yet only in its pioneering stage. The future is already full of promise, because the foundations have been well laid. In soil surveys and soil science the Soil Bureau has placed New Zealand in the front rank of countries which have devoted attention to this important phase of national welfare.

Farm Buildings: Drawings and Quantity Schedules Available from Department

DRAWINGS of farm buildings and constructional designs that are too detailed for publication in "The New Zealand Journal of Agriculture" will be supplied by the Department of Agriculture to farmers wishing to construct their own buildings. The plans, with schedules of quantities, may be got from Machinery Instructors at the Department's offices in Auckland, Palmerston North, Wellington, Christchurch, and Dunedin.

Roof Trusses

Farmers may find that prepared designs for items such as roof trusses can be of great advantage. The Extension Division of the Department has now available prepared designs of timber roof trusses designed for 10ft. spacing to carry corrugated galvanised iron roofing.

Particulars of trusses for spans of 22ft., 25ft., 30ft., 35ft., and 38ft. are available, any spans between these being covered by the lengths above; for example, a 23ft. 6in. span could be met by the use of a 25ft. span design truss with members shortened to suit the shorter span.

Fertiliser Store and Implement Shed

Drawings with schedules of quantities are also available for the construction of a complete implement shed and fertiliser store, either as a single unit or as separate units.

The implement shed measures 44ft. 9in. by 19ft. 4in. and the fertiliser store, which is designed to hold 60 tons, measures 15ft. 1in. by 19ft. 4in. Construction is in timber with a corrugated galvanised iron roof.

—H. W. T. EGGERS, Engineer, Department of Agriculture, Wellington

"Pruning for New Zealand Conditions": E. O. Petersen

THIS publication provides information in compact form for the New Zealand gardener on the pruning of a wide range of trees and plants.

The section on pruning and training of hedges is welcome, especially as separate recommendations are given for a variety of plants and all hedge plants are not treated alike.

In the chapter on roses the author has dealt fully with a difficult subject; brief notes have been given on the treatment of a large number of ornamental trees and shrubs which for convenience have been listed alphabetically in various groups. Other sections deal with the pruning of the different bush and climbing fruits and with tree fruits and grapes.

This is one of the most comprehensive publications on pruning which has been written specially for the New Zealand gardener.

The reviewer suggests that for future editions sectional headings within each chapter and more stress on the early training of South African and Australian plants would be valuable.

—R.G.H.

A. H. and A. W. Reed, Wellington. 4s. 6d.

"Herefords in New Zealand"

THE New Zealand Hereford Cattle Breeders' Association are to be congratulated on the admirable booklet "Herefords in New Zealand" (75 pp. of letterpress and 32 pp. of stud advertisements) which they have just published.

The origin and characteristics of the breed, its history in New Zealand, and polled Herefords are all discussed. The section on judging and selecting Hereford cattle is concise and lucid. Other articles include material on the various aspects of management, show presentation, and related subjects.

The photographs of Herefords in typical country and illustrating Hereford points are not the least attractive feature of a publication, which can be read with interest and profit by all who have to do with cattle, whether Herefords particularly or other breeds.

—A.D.M.G.L.

New Zealand Hereford Cattle Breeders' Association, 117 Kimbolton Rd., Feilding.

Fire Hazard Warnings

"HERE is a message from the Forest Service.". These now familiar words are often heard over the air during spring, summer, and autumn, with warnings of fire hazard in various parts of the country. This article by W. F. Wright, Fire Control Officer, New Zealand Forest Service, explains the circumstances which prompt these warnings and emphasises the need for constant care to prevent forest fires.

THE radio messages issued by the Forest Service are usually heard when the national stations are linked for the weather forecast, which most country people tune in to hear. Hence, one can be sure that the greatest number of people hear that there is acute danger of forest fires, say, in the southern lakes districts. Though this may not rivet the attention of listeners in Northland, where it may be raining at the time, they cannot help hearing about it. Two objects are thus achieved:—

1. Southlanders are warned of the fire danger.

2. Northlanders are reminded about the business of fire prevention.

These messages are normally heard on the national link for two or three days in succession, and then there may be silence for a while. This will not mean that the fire danger in Southland has passed. Warnings may still be issued from a local broadcasting station. The national link is used sparingly, for emergency purposes only, in the hope that such warnings will command the attention of all listeners.

Farmers' Use of Fire

It is often asked why a Forest Service officer should be better than an experienced farmer in judging when it is safe to burn. It is a matter of approach and special techniques.

There are still many farmers who must use fire to some extent. Each has his own special problems with this country's complex climate and topography. Farmers understandably enough tend to view matters according to their special needs, and from the nature of their calling are strongly individualistic in outlook. The farmer must often burn to clear rubbish on rough grazing country or to prepare land for sowing. If he is not allowed to burn when he thinks the conditions are right for him, his programme is sometimes upset and very understandably he is displeased.

A forest officer is a member of a service which has the statutory responsibility to manage the national forests for water and soil conservation, the maintenance of scenic and recreational amenities, and the production of timber. Any form of forest management or preservation would be impossible under New Zealand conditions without the power to control the use of fire within forests and on adjoining lands. A forest officer therefore thinks in terms of fire control and is sure that it is in the national interest that he should do so. The Forest Service also has a responsibility to warn other rural fire authorities when a fire hazard exists in any area.

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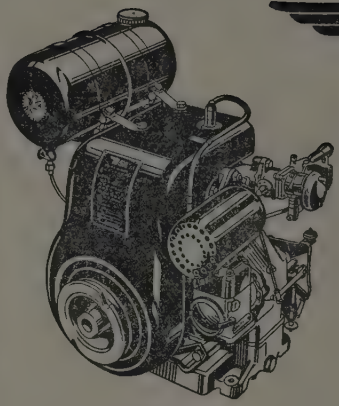

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Happily there is now a much better understanding in most districts between the farmer and forester about fire control, and relations are now generally cordial. It is certainly the policy of the Forest Service that they should be so. However, the farmer as a rule is not now the main problem in fire control. Rapidly expanding urban communities in their contacts with forest and rural areas pose the problems.

Fire Hazard Prediction

In New Zealand all rural fires are caused by human action in one way or another. Dry lightning, a major cause of forest fires in many countries, does not occur here. Trees are set on fire, yes, but not forests, because lightning is usually followed by rain here. This being so, a forest officer in discussing fire control can never resist an opportunity for anti-fire publicity. He will always try to influence people to be careful with fire.

How is fire hazard predicted in this capricious climate? The story goes back 30 years or more to the United States of America, where there had been a long period of appalling forest fires. The Pesktigo fire in 1871 in Wisconsin, for example, destroyed 1,280,000 acres of forest and burnt 1500 people to death.

The forest services of the U.S.A. and Canada put research teams on to looking into the causes of forest fires, and a number of principles were established for the control of rural fires. This article is concerned only with those relating to weather and fire behaviour and the techniques developed for the prediction or assessment of fire hazard conditions. As any hill country farmer knows, fire rarely behaves in the same way for two days running, even when all the conditions appear to be similar. A sluggish burn one day may be followed the next day by a fire which will bring along a forest officer with a what-do-you-think-you-are-playing-at expression on his face.

The data used in fire hazard prediction are:—

1. Number of days since .25in. or .50in. of rain.

2. Moisture content in forest litter, dead scrub, and bracken.

3. Air humidity.

4. Temperature.

5. Wind force.

6. Condition of vegetation in open country.

When the air humidity is very low it is the most important factor of all. With very dry air almost any form of forest vegetation will burn. An example of such "blow-up" conditions occurred in 1937, when 4000 acres of virgin rimu-matai-totara forest in the Tongariro National Park locality literally exploded. Rainfall, temperature, and wind are recorded in the usual way.

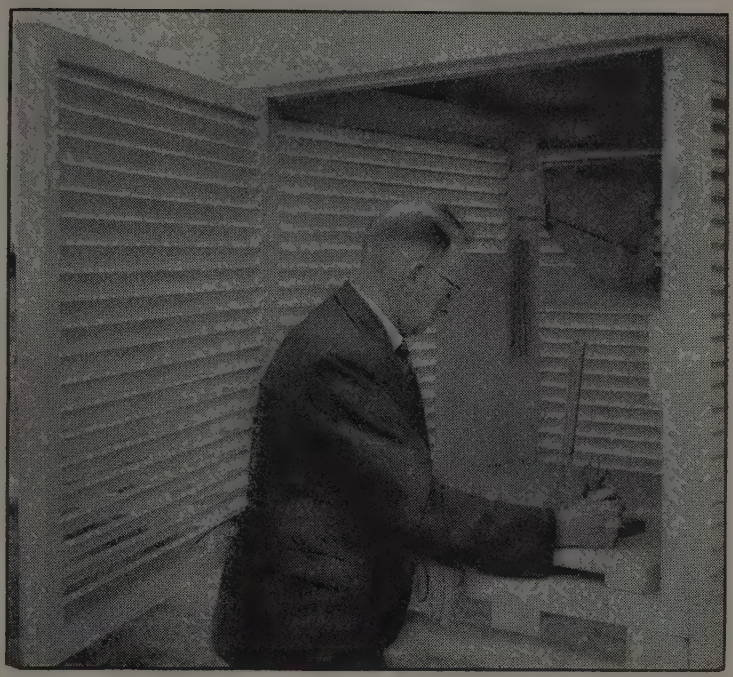
Air humidity is measured by an instrument called a psychrometer, which is simply a pair of "wet" and "dry" thermometers coupled together. This instrument is revolved in the air and the thermometers are read against a set of tables to find the air humidity.

The moisture content of forests is found by specially prepared pieces of wood called indicator sticks. These register changes in the fuels due to the combined effect of temperature, humidity, rainfall, and wind. One stick ½in. x ½in. represents quick-drying fuels such as bracken, manuka, and dead litter in the open. The second stick 2in. x 2in. simulates the cumulative effect of the same factors on heavier fuels. The sticks are weighed on a scale which registers the moisture present in the fuels as a percentage.

These data are then correlated by a set of tables or meter on the slide-rule principle, in which the several factors are given weighted values according to their relative importance in fire behaviour, to give one of nine ratings of fire from 0 to 9, where 9 is extreme danger.

Readings from 40 fire-weather stations maintained by the Forest Service are radioed twice daily to the head office of the Service during the fire season. When the readings from a district give a rating of 6, considerable danger, or higher the Weather Office is asked for a forecast for the district. If this is not reassuring, the familiar "Here is a message from the Forest Service" is heard at the time the national weather forecast is broadcast.

FIRE HAZARD WARNINGS



Reading the special instruments at one of the 40 fire hazard stations of the Forest Service in New Zealand. The stick indicating the dryness of light fuel is hanging on the special scale in the background.

Government-approved Turnip and Swede Seed

NEW ZEALAND Government-approved turnip and swede seed for distribution this year has, as previously, been made into a single blend for each variety and packed in 1lb. and 2lb. calico bags. With two exceptions the germination of all varieties being distributed in 1955 is over 90 per cent. Germination of the exceptions, N.Z. Grandmaster swede and N.Z. Purple Globe turnip, is 88 per cent. and 87 per cent. respectively.

All packages of Government-approved turnip and swede seed being distributed to retailers this year carry the letter A as an identification mark.

Care of Livestock during November

Contributed by the Animal Research Division

DURING the season of maximum grass growth the problem is to control pastures at their most leafy, nutritious stage. This is best achieved by conserving all growth surplus to requirements as silage and hay. Later in the season it is important to maintain sufficient pasture cover to ensure growth during the dry summer period. As grass growth declines the period which paddocks are spelled between grazing should be gradually increased and as much silage as the cows will clean up should be fed out.

GRAZING MANAGEMENT OF DAIRY PASTURES

If dry ewes have not already been removed from the flock, they should be separated immediately. It is a good plan to shear them, and during shearing they should be inspected carefully for udder abnormalities. All ewes whose udders were empty at lambing and ewes with diseased udders, damaged teats, very large teats, very small teats, or badly placed teats should be culled. Dry ewes with defective mouths and old ewes which did not have a lamb this year should also be culled. Dry ewes which are retained should not be allowed to get too fat during summer. If kept in hard store condition, they are more likely to hold when mated next autumn.

DRY EWES

Dry sows should have access to good pasture and in addition should receive from 2 to 4 gallons of skimmed milk per day, depending on their condition. They should be kept thriving, but should not be allowed to become too fat. Keep only as many of the spring litters for baconers as can be fed adequately. The remainder should be sold as porkers.

CARE OF PIGS

Preparations for shearing should be made now. Attend to sheepyards and scrub out the woolshed. This will reduce trouble from such diseases as blood poisoning, tetanus, and caseous lymphadenitis ("lympho") after shearing. Check over all machinery to see all parts are in good working order. Dag all dirty sheep and shear hoggets, wethers, dry ewes, and rams. When culling sheep before shearing pay particular attention to teeth and udders and watch for dropped bellies. On fat lamb farms ewes are best shorn after one or two drafts of lambs are away.

SHEARING PREPARATIONS

Vaccination has reduced the New Zealand average rate of abortion in dairy cows from about 5 per cent. to 1 per cent. However, there are still too many dairy farmers who do not have their calves vaccinated. Past freedom from abortion is no excuse for not vaccinating, as infection may be introduced into a herd at any time. Though vaccination does not start until January or February, application for vaccination should be made now, as Veterinarians and Livestock Instructors have to plan their vaccination itineraries and late applications make this very difficult. Calves should not be vaccinated until they are over 4 months old. Poor immunity results if they are vaccinated before this.

VACCINATION AGAINST CONTAGIOUS ABORTION

Pastures on which ewes and lambs are grazing should never be allowed to become rank. If pastures are getting too long, they can best be controlled by cattle. Yearling beef cattle soon become quiet and they can then be run with ewes and lambs, even in small paddocks.

CONTROL OF FAT LAMB PASTURE

Rams should be dipped before they begin to flush, preferably before Christmas. Flushed rams sometimes scald after dipping.

DIP RAMS EARLY

Dairy Produce Graded for Export

THE following figures showing quantities of dairy produce graded for export during August, with comparative figures for the same month of 1954, have been compiled by the Dairy Division of the Department of Agriculture from figures supplied by divisional officers at the various grading ports:—

BUTTER

Period	Creamery (tons)	Whey (tons)	Total (tons)	Percentage Inc. or dec.
August 1955	9,913	103	10,016	—
August 1954	9,276	117	9,393	—
Increase or decrease ..	+637	—14	+623	+6.632

Butter in store at 31 August 1955 was 9,664 tons

CHEESE

Period	White (tons)	Coloured (tons)	Total (tons)	Percentage Inc. or dec.
August 1955	1,375	—	1,375	—
August 1954	2,043	—	2,043	—
Increase or decrease ..	—668	—	—668	—32.697

Cheese in store at 31 August 1955 was 11,748 tons

If these figures are converted into butterfat equivalent, there is an increase of 3.123 per cent. in butterfat graded for August as compared with the corresponding month of the preceding season. The above figures refer only to butter and cheese graded for export, and owing to diversions which may take place from time to time they are not necessarily a true indication of production trends.

Summer Management of Pastures

Seasonal Notes by the Extension Division

A LOOK over any extensive area of pasture land about midsummer will show the need for some improvement in the grazing management on many farms to cope with the late spring and early summer flush of feed. There is far too much useless long growth scattered over paddocks. This tall growth generally consists of the less palatable grasses and weeds; it smothers the clovers and has lost its feeding value because it is dry and stemmy. Moreover such growth cannot be kept for winter feed, as it rots with the autumn rains, leaving the sward open to the invasion of weeds. Where considerable areas of the pastures have been allowed to get away into long, dry growth in summer the stock confine their grazing to the clean areas, which are then severely overgrazed and tend to dry out rapidly in hot weather to the detriment of the better pasture species.

HANDLING SURPLUS GROWTH

THE problem of handling the flush of growth so that surplus feed is not lost and the pastures as a whole are kept in good order to produce feed through summer and autumn has been tackled in various ways. On the well-managed dairy farm as soon as pasture growth is in excess of stock requirements the grazing area is restricted by closing some of the paddocks so that the stock fully control the growth on part of the farm while the surplus is saved in several paddocks. This surplus grass is removed as silage and hay while it is still good feed and the whole of the farm pastures go into summer in good grazing order. In wet summers or where summer-growing grasses such as pasalum or timothy are used this form of control is continued as long as the feed position requires. The mower is also used for topping excess growth on grazed pastures to keep them in good order.

On fat lamb farms much the same methods can be used. The stock that are wintered plus the spring crop of lambs cannot cope with the flush of feed and the mower and cattle must be used to handle surplus growth. Where pasture seeds can be harvested the closing of paddocks for seed in late October and early November will give control, the stock being concentrated during the flush of growth on an area where they can control the feed. Where seed production is not possible paddocks should be closed for silage or hay and saved for winter feed for cattle and sheep. Paddocks closed in November and December can provide very useful fattening and maintenance feed for cattle in summer and early autumn.

On hill country the saving of the surplus growth on selected paddocks by the removal of stock to adjacent paddocks during the flush period is a practice that is developing rapidly and is well worth while. The grazed areas are kept in good order by the heavier stocking, and the grass on the spelled areas can and should be cleaned up by cattle in December and early January so that these paddocks are ready for sheep grazing again before dry weather sets in. Such paddocks are invaluable for lamb weaning. Paddocks weak in clovers benefit especially by this spell, which lets the clovers reseed.

In wet summers much valuable feed can be carried on to winter by the systematic spelling of paddocks to save feed not required. Cattle can deal with surplus growth concentrated in spelled paddocks much better and more easily than with growth scattered over the farm.

—C. J. HAMBLYN

* * *

EARLY WEANING OF LAMBS

EARLY weaning of lambs (at, or even before, the time the first draft is sent away) is gaining favour on fat lamb farms, because it allows for better pasture management and provides for the lambs getting the best of the feed available for fattening. Work at the Department of Agriculture's Ruakura Animal Research Station has shown that lambs get very little sustenance from the ewes after 4 months and depend on good grass for fattening. At weaning the ewes are run in mobs and are used in much the same way as cattle to clean up paddocks before spelling them for 2 or 3 weeks for the lambs. This system of clean grazing and spelling has a very beneficial effect on the pastures, on which good lamb-fattening feed can be maintained into summer.

The cover obtained by regular spelling reduces the drying out effect of hot weather. By mob stocking of the ewes paddocks can also be spelled in late January and early February. This makes available a flush of feed for the ewes before the rams go out.

Early weaning of lambs and mob stocking of pastures with ewes are also advantageous on hill country.

—A. A. DUNCAN

* * *

WHITE CLOVER FOR LAMB FATTENING

FAT lamb farmers in Poverty Bay and, in fact, all fat lamb farmers are recommended to study the article by J. E. V. Simpson and D. P. Sinclair on white clover for lamb fattening which was published in the March 1955 issue of the "Journal". The article discusses the outstanding results in lamb fattening trials at the Department of Agriculture's Manutuke Research Station, Poverty Bay, from use of pedigree strain white clover pastures compared with results on perennial ryegrass pastures typical of the district. It includes also practical experience with white clover as lamb fattening feed on a Poverty Bay fat lamb farm.'

Though the article stresses the possibilities of white clover for Poverty Bay conditions, there is no doubt that with the advent and more extensive use of short-rotation ryegrass and pedigree strain white clover for pastures on fat lamb farms in many other districts the value of white clover for lamb fattening could be exploited elsewhere.

The most striking features of the fattening practice discussed are the outstanding superiority of white clover when properly managed in putting weight on store lambs in summer and autumn, not in just one season but over five successive years, and the surprising number of lambs that can be fattened per acre on this type of pasture.

—H. de O. CHAMBERLAIN

* * *

SPELLING HILL-COUNTRY PASTURES TO ALLOW RESEEDING OF SUBTERRANEAN CLOVER

THE development of a good showing of subterranean clover on hill country after the oversowing of this species depends on the reseeding of the plants already established. Subterranean clover is an annual and all plants die off in summer after seeding. If the sward is kept close grazed throughout the flowering time in October and November, seed is set close to the plants and the spread of the clover can be very slow, but the spread can be speeded up by spelling the area so that the established plants can make full growth, thus extending the flowering runners in all directions from the original plants.

The plants bury the seeds as they ripen along the runners so that the area covered with the clover the following autumn is very much extended. This objective can be achieved by removing all stock from about the end of October until late December. Such spelled areas should then be grazed with cattle, which further assist in the spread of the clover seed over the paddock. Early spelling in addition to providing for the freer and more widespread seeding of subterranean clover also allows cocksfoot and perennial ryegrass to make headway in competition with browntop and other inferior species.

—F. H. COLLIN

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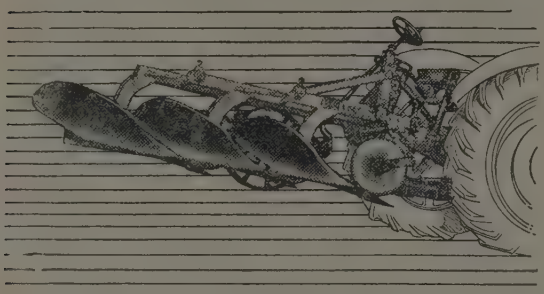

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Manuring of Vegetable Crops in the Home Garden

THE manuring of garden crops is simple or highly involved according to the standard aimed at. It is simple because the general nutritional needs of plants are well understood and usually can be met fairly simply. It can be highly involved if the aim is to supply the optimum nutritional needs of any particular plant or group of plants in a particular soil for a considerable period. In this article A. G. Kennelly, Horticultural Instructor, Department of Agriculture, Dunedin, discusses the manuring of vegetable crops and deals with work in the home garden in November.

THOUGH a fertiliser mixture may stimulate the growth of a wide range of crops, no fertiliser mixture can supply the optimum needs of a plant throughout its life. Plants need at least 12 elements for growth. The number of trace elements has not yet been clearly determined for all kinds of plants. The elements nitrogen, phosphorus, and potassium are those most likely to be in short supply, owing to the high demands plants have for them.

Nitrogen is the element principally responsible for the growth of foliage, its greenness, and its succulence. Plants such as cabbage and lettuce benefit from an abundance of nitrogen. Deficiency is marked by poor growth, lack of dark green succulent foliage, short, thin, upright shoots, and early defoliation. Too liberal use of nitrogen produces a weak constitution, soft, sappy growth, liability to disease, and delay in maturity. Nitrogen is usually needed most in spring.

Phosphorus is especially important in flower, fruit, and seed production and is beneficial in encouraging root growth in young plants. It is best dug into the soil before seed is sown or plants are set out and it should be a component of most seed composts. An excess hastens ripening and in this respect counteracts excess nitrogen. A deficiency is associated with stunting of roots (particularly the lateral fibrous rootlets), restricted growth, and short, thin, upright shoots. If the deficiency is acute, small leaves grow at right-angles and finally become bright red, yellow, or purple and early defoliation occurs. Symptoms generally are very like those of nitrogen deficiency. Department of Agriculture trials indicate that many New Zealand soils are deficient in phosphorus.

Potassium is regarded as important in the general health of the plant in developing sturdiness and disease resistance. It helps to promote the growth of woody tissues and improves texture, colour, and quality. Deficiency symptoms differ somewhat with different plants, but generally they show as restricted growth and short internodes; if the deficiency is severe, the symptoms are die-back of lateral growth, bluish green leaves with loss of green colour between the veins or on the edges, or leaf scorch. Potassium has not been proved deficient in a great many New Zealand soils.

Apart from the major elements nitrogen, phosphorus, and potassium, and trace elements such as molybdenum, zinc, and boron another group of elements is needed by plants in considerable quantity. Most of these occur as impurities in commercial fertiliser, though one of them, calcium, is best supplied as lime.

Growth of plants does not result because one or other factor is exceptionally favourable or even from the average of all factors. It is governed by the factor that is least favourable, which is known as the limiting factor. For instance, if plant nutrients, moisture, and other conditions are ideal but temperature is too low, growth will be limited by temperature—the increase in plant growth will, up to a certain point, be related approximately to the rise in temperature. Similarly, if the soil is well supplied with combined nitrogen and with potash salts and a complete fertiliser (one containing nitrogen, phosphoric acid, and potash) is added, the response will be approximately in proportion to the amount of phosphoric acid added, not to the amount of the complete fertiliser added.

There are further complications, such as the interaction of one factor with another, but the main point is that an attempt to offset a deficiency in one respect by improvement of other factors does not generally assist the plant.

Plant Nutrition and Soil Analysis

Meeting the exact needs in nitrogen, phosphorus, and potassium of a plant or crop is not easy, because in addition to the fact that soils differ in their content of these elements, plants need the three elements in different ratios according to whether they are grown for leaves, roots, or seed, and the ratios vary at different stages of growth and usually at different temperatures.

Plants have a method of obtaining food elements from the soil which cannot be exactly duplicated in the laboratory. The nutrient status of a soil also may be difficult to assess, as an element may be present in apparently adequate quantity but may be in a form (or conditions of the soil may be such) that its availability is low.

Soil analysis is fairly commonly used for farm crops to determine the nutrient status of soils, particularly for the principal elements. However, the most satisfactory results are likely to be obtained if soil analysis is used in conjunction with such supporting evidence as plant tissue tests and field trials and where preferably a considerable amount of information has been built up about the nutrient needs of particular crops and the nutrient status and response of similar soils.

[*Sparrow*

Most crops benefit from regular though moderate liming. Lime is the most important source of the plant food element calcium and it also makes soil conditions less acid.

Soil Analysis in Home Garden

Soil analysis as a means of determining the needs of plants in the home garden is not usually regarded as practical, but this should not cause the home gardener concern, because home garden soil which is adequately

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supplied with good-quality organic matter and to which fertilisers rich in nitrogen, phosphorus, and potassium are applied is likely, other factors being satisfactory, to be highly productive.

The richest sources of the principal elements are the artificial fertilisers which are used almost universally in commercial production, either singly or in combination according to the crop and soil. Because of the difficulty in determining the exact nutrient needs of each crop in a home garden and because the common fertilisers are relatively cheap, the simplest method for most home gardeners is to purchase or mix a complete fertiliser, that is, one containing nitrogen, phosphorus, and potassium.

Fertilisers readily available in New Zealand include the following:—

[Green and Hahn

Superphosphate is a good source of the important element phosphorus, which is especially important in flower, fruit, and seed production and in encouraging root growth in young plants.

Nitrogenous

Sulphate of ammonia (20.6 per cent. of nitrogen; soluble in water) is slower acting than nitrate of soda and is not readily washed out of the soil. It is especially useful where rainfall is high and can be applied in one dressing if thoroughly incorporated in the soil. It can be mixed with superphosphate if used immediately and also applied with sulphate of potash. It is usually applied at about ½oz. to 1½oz. per square yard, and if for a topdressing to young plants, preferably in two or three applications at 2- or 3-weekly intervals. If sulphate of ammonia is used regularly, moderate liming is essential.

Nitrate of soda (16 per cent. of nitrogen; soluble in water) is very quick acting and is useful for side dressings for leaf crops such as cabbage. However, as it is liable to be washed away, it should be applied in several dressings with intervals between the dressings to prevent loss. Nitrate of soda can be applied at ½oz. to about 1½oz. per square yard, but the same precautions in applying it should be observed as for sulphate of ammonia. Evenness of distribution is made easier by mixing it with several times its bulk of sand or fine, dry soil. Both sulphate of ammonia and nitrate of soda can be applied as liquid manure at ½oz. to 1oz. to 2 gallons of water.

Dried blood (average of about 12 per cent. of nitrogen; insoluble in water) can be applied at up to 8oz. per square yard; 2oz. to 3oz. per square yard is usually satisfactory.

Phosphatic

Superphosphate (20.1 per cent. of phosphoric acid; soluble in water) is usually applied at about 1oz. to 3oz. per square yard.

Basic or reverted phosphate (reverted superphosphate) is made up of 85 parts of superphosphate and 15 parts of lime (19 per cent. of phosphoric acid; insoluble in water). Except where a particularly quick flush of growth is desired, reverted superphosphate is preferable to ordinary superphosphate for the home garden, as it does not damage the bag in which it is stored and is less liable to cause germination injury to seed. Though reverted superphosphate is less soluble than ordinary superphosphate, it is generally considered less likely to become fixed (rendered unavailable) by the soil. It should be applied at about 1oz. to 3oz. per square yard.

Superphosphate is also available specially treated with trace elements, for example, borated superphosphate and molybdenised superphosphate.

Steamed bone flour (1.5 to 3 per cent. of nitrogen and 22 to 27 per cent. of phosphoric acid; insoluble in water) is very useful as a drying agent when mixed with other fertilisers and serves to prevent caking. It decomposes readily in certain light soils. It is usually applied at 1oz. to about 3oz. per square yard.

Phospho-nitrogenous

Ammoniated superphosphate (6.4 per cent. of nitrogen and 13 per cent. of phosphoric acid; soluble in water) consists of 2 parts of superphosphate and 1 part of sulphate of ammonia. It is usually applied at about 1oz. to 3oz. per square yard.

Bone meal or bonedust (average of 3.6 per cent. of nitrogen and 22.5 per cent. of phosphoric acid; insoluble in water) is usually applied at about 1½oz. to 3oz. per square yard.

Blood and bone (average of 6.7 per cent. of nitrogen and 12.1 per cent. of insoluble phosphate) is usually applied at about 1½oz. to 3oz. per square yard, though occasionally at up to 8oz. per square yard.

Bone manures act best on soils deficient in lime or in soils rich in organic matter.

Potassic

Sulphate of potash (48.6 per cent. of potash; soluble in water) is usually applied at about ½oz. to 1oz. per square yard.

Muriate of potash (58 to 60 per cent. of potash; soluble in water) should be applied at the same rate as sulphate of potash.

Sulphate of potash is preferred on heavy soils and under glass and for tobacco, tomatoes, potatoes, and certain other groups.

Wood ash (1 to 10 per cent. of potash).

Many seaweeds are good sources of potash, but generally their main value in the home garden is as a source of organic matter.

Ideally, the home gardener should make up his own combinations of manures to meet his own particular needs. Good general mixtures suitable for base dressings for a wide range of soils should contain nitrogen, phosphoric acid, and potash in the ratio of 1:2:1. One mixture prepared to meet these requirements which has

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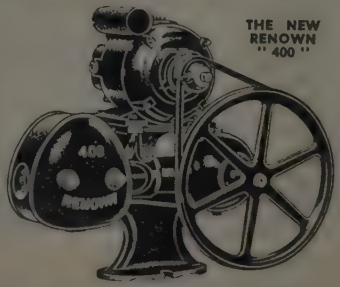

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given good results in commercial practice is composed of the following:—

	Parts by weight
Blood and bone	7
Superphosphate	7
Dried blood	2
Sulphate of ammonia ..	2
Sulphate (or muriate) of potash	2

Leafy vegetables have a high nitrogen requirement so that if the above mixture is used as a base for them, it should be supplemented with side dressings of a combined fertiliser with a higher proportion of nitrogen.

Where there is evidence of specific deficiencies further suitable materials can be added, for example, magnesium sulphate (Epsom-salt) for magnesium deficiency and molybdenised superphosphate for molybdenum deficiency, to which whiptail of cauliflower is due. Such mixtures can be dissolved and watered on as sprays or side dressings according to which is most appropriate.

Packaged Fertilisers

Recently "new" fertiliser mixtures have been marketed in attractive packages, the materials being described as leaf-feeding plant foods, liquid plant nutrients, water-soluble plant foods, or plant-growth tablets. In the accompanying literature they are recommended for spraying on foliage or applying in solution or in tablet form to the soil. Most of these, fundamentally, are mixtures of completely water-soluble fertiliser containing nitrogen, phosphorus, and potassium. Though the preparations are claimed by the makers to be balanced plant foods some contain a high ratio of nitrogen in relation to phosphorus and potassium.

Such mixtures would be likely to give good results where the need for nitrogen was high, but would be less satisfactory where the greatest need was for phosphorus or potash.

Equivalent conventional fertilisers are much cheaper per unit of plant food than many of the so-called "liquid plant foods".

With the exception of trace or minor elements such as manganese, zinc, and magnesium (which are not commonly deficient in home garden soils in New Zealand) the application of nutrient elements by spraying them on foliage is unlikely to be better than the orthodox method of applying the element to the soil. If the element is sprayed on in sufficient strength to correct the apparent deficiency, there is the additional risk of leaf scorch, particularly if the spraying is done in bright sunlight. In addition, important elements such as potassium, magnesium, and calcium and most of the trace elements are usually strongly held in the clay particles or organic matter of the soil and their downward movement by leaching is usually slow. They may therefore be applied better in solid form and well mixed through the soil of the root zone.

[*Sparrow*

In the more humid districts potatoes need to be sprayed regularly with fungicidal spray to protect them against late blight.

Work in November

November is usually a busy month in the home garden. Where soil conditions are good the home gardener has the satisfaction of seeing his crops respond with vigorous growth to the higher temperatures that are usual during the month. Broad beans, lettuces, radishes, turnips, spinach, spring onions, and spring cabbages are available in most good gardens, but there is still work to be done. The ground should be kept weed free and thinning done in good time. Seed of winter greens such as Savoy cabbage, broccoli (winter cauliflower), and curly kale can be sown. In most southern districts a first sowing of swedes can be made and where conditions are not too hot and dry peas can be sown.

Successional sowings of salad crops such as lettuce, radish, spring onions, and turnips and the planting out of cabbage, cauliflower, and lettuce to mature in late summer and autumn should be attended to. Support should be provided where necessary for crops such as tomatoes and climbing beans. Beds can be prepared for an early planting of celery, earlier planted potatoes can be earthed up where there is risk of infestation from larvae of the tuber moth or greening of the tubers, and the planting of the main crop completed. Asparagus should not be cut for too long each season, as this may weaken the crowns; about 6 to 8 weeks is usually long enough.

The sowing or planting of frost-tender subjects such as french or runner beans, cucumbers, marrows, pumpkins, and squash, tomatoes, sweet corn, and in favourable districts, kumaras can be proceeded with except in parts of Canterbury and in the south, where there is danger of frost until the second week in the month.

Celery

In central and northern districts celery can be set out during the month in beds or trenches in soil that has been heavily manured. Beds are usually made 4 to 6 rows wide with the plants set out 10in. to 12in. apart each way. In trenches a double row 9in. to 12in. apart with the same spacing between plants is satisfactory. The trench can be any depth up to 12in.

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Blanching of double rows can be done by drawing the soil high against the ribs, care being taken not to allow any to get into the centres of the plants, or by wrapping individual plants with stout paper. Beds containing multiple rows are best blanched by placing a length of 12in. x 1in. timber along the outside edges of the bed. Blanching should not be begun until the plants are about 3 weeks from maturity, as otherwise their development will be arrested.

Where poultry or farmyard manure is lacking or in short supply a mixture of 4 parts of blood and bone, 2 parts of superphosphate, and 1 part of potash by weight can be broadcast over the area at ¼lb. to a square yard and worked into the soil after digging.

Celery should be kept free from weeds, and to control leaf spot a coverage of Bordeaux or suitable proprietary copper preparation should be maintained on the foliage by spraying every 10 to 14 days. Where aphides are troublesome nicotine sulphate 1 : 800 (1 fl. oz. of nicotine sulphate to 5 gallons of spray) can be added to the Bordeaux. Celery should not be planted on a part of the garden recently occupied by a carrot crop which has been affected by the carrot rust fly, as the pest is also liable to attack celery.

Potatoes

Cultivation of established potato crops should be attended to by the removal of weeds and the banking of soil from between the rows against the haulms and developing tubers, so that the rows are hilled in steep inverted V shape. This affords protection against the caterpillar of the potato tuber moth and also ensures that should the foliage become badly infected with late blight, spores are not so likely to be washed on to the tubers and cause tuber infection.

Potatoes can still be planted as advised in last month's notes. A main-crop variety can be chosen. Well-drained soil rich in humus is preferable, and virgin soil or soil heavily manured for a previous crop is suitable. Grass clippings or a green crop dug in before planting will provide humus. Lime is rarely necessary or desirable, as the potato does well in an acid soil and the alkaline conditions induced by lime favour the development of scab disease, which is

Cucurbits include pumpkins (1), → cucumbers (2), marrows (3), and melons (4). All are frost tender and need warm conditions for growth. Plants should be set out as soon as possible after the date of the last killing frost and no time should be lost in sowing or planting where this has not yet been done. Photographs by Sparrow (1, 3, and 4) and Green and Hahn (2).

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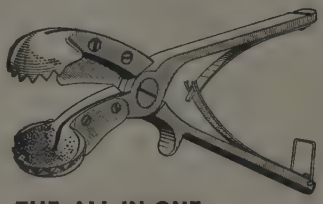

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also common in soils poor in organic matter.

Popular main-crop varieties include Aucklander Short Top, Inverness Favourite, Dakota, King Edward, Arran Chief, and, in the north, Northern Star.

Late Blight

Late blight, also known as potato blight and Irish blight, does not appear every season in some districts, but in most parts of the North Island and in some parts of the South Island it is advisable to spray potatoes, since neglect of this precaution may result in total loss. Spraying should begin when plants are about 5in. to 8in. high and applications should be repeated at least at monthly intervals.

If, despite precautions, the foliage is severely infected and the crop cannot be dug at once, the haulms should be cut off at ground level, or the gardener can remove them by standing on the potato ridge (with one foot on each side of a plant to hold the tubers in place) and pulling the haulms away.

Pumpkins, Squash, Marrows, and Melons

The culture and soil requirements of pumpkins, squash, marrows, and melons are much the same, though melons need warmer conditions than the others. None of these plants should be sown in the open to be above ground before frost danger is past and the ground must have warmed sufficiently and not be too wet or the seed is liable to rot. The plants thrive in a wide range of soils, from sandy to moderately heavy, provided there is an assured supply of moisture (preferably held in suspension in the soil) and plenty of organic matter.

[*Green and Hahn*

Brussels sprouts remain in bearing for a long time and the period can be extended by making successional plantings.

[*Sparrow*

Parsnips are a good winter vegetable. A sowing can be made now. For good-quality, long, straight roots the ground should be deeply dug.

Well-drained, light, warm, aerated soils are best for early crops, but for main crops heavier soils usually give a higher yield over a longer period. Organic matter can be increased by digging in a green crop, but particularly in colder districts better results are obtained if 1 cub. ft. of soil is removed at 2ft. to 3ft. intervals and the holes, except for the top 3in. or 4in., are filled with manure (preferably with partly rotted, fermenting stable manure). Seed can be sown in soil placed on top or, preferably, at the edge of the manure. Rows should be at least 4ft. apart; this is known as the hill system of sowing. The ground should if possible be level after sowing to facilitate any necessary watering.

Apart from watering and weed control very little attention should be needed after plants are established. With trailing varieties it may be necessary to pinch out the ends of leaders when they are about 18in. long to encourage the development of

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laterals. Plants can be trained by pegging the runners with sticks.

The fruit of marrows should be cut when young, preferably before the skin hardens to the extent that it cannot be broken easily by the thumbnail; 10in. to 12in. is a good size. As marrows increase in size their flavour usually is reduced and the seeds increase in size. In favourable seasons, too, early cutting of the fruit induces more to develop, and it is therefore inadvisable to allow fruit to reach full maturity unless very large specimens are wanted or fruit is to be stored for winter.

Rhubarb

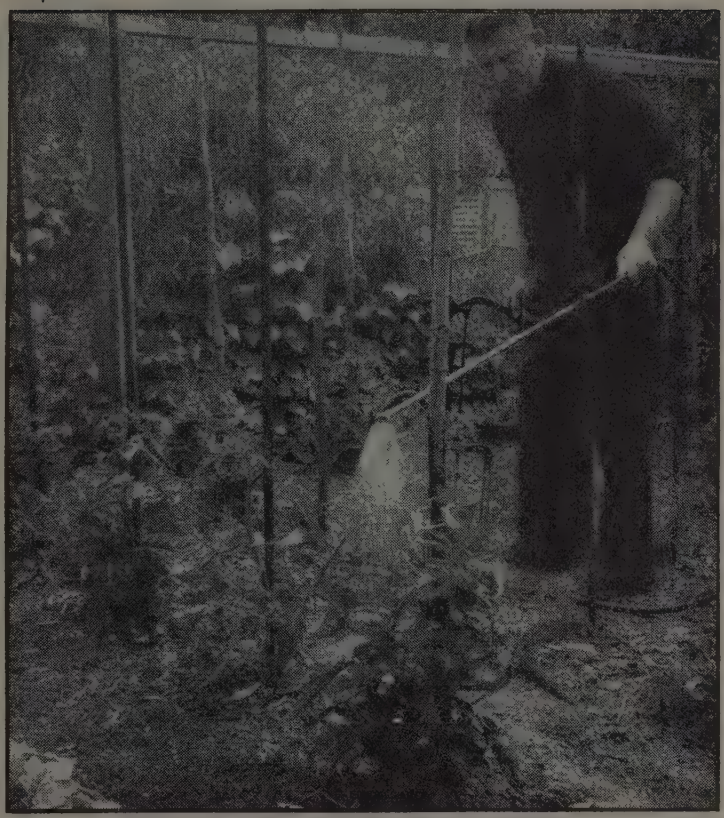
Rhubarb responds to liberal manuring, but production from even the healthiest well-fed crowns is liable to be affected if harvesting is continued too long on a heavy scale. Pulling the stalks exhausts the plant and the crown must be given an adequate period in which to develop the leaves which enable it to build up stores of plant food for the following season. Most varieties are dormant for a time and the leaves must be enabled to do their work before dormancy occurs. Beds should not become dry, and those in ever-bearing varieties that are low in plant food should be watered with liquid manure.

Swede Turnips

In growing conditions that suit them swede turnips mature in from 55 to 90 days, but growth and yield are greatly influenced by climate. Varieties that require a long growing season thrive best in cool, moist climate with neither dry periods nor very heavy rain. Sunshine is not important; in fact, because of the moister conditions longer-maturing varieties generally do best in late autumn, when sunshine is reduced.

Good swedes are a very useful addition to the home garden, particularly in the far south, where conditions enhance their quality and flavour. Swedes are high yielding and, like turnips, do not require special soil, provided drainage is good and there is adequate moisture. They respond well to a soil moderately rich in well-rotted and well-incorporated organic matter. A dressing of superphosphate at 1oz. to 2oz. a square yard is advantageous on many soils.

In the home garden swedes are usually grown for late-autumn and winter use, and in southern districts a sowing can be made in November or December; further north December or January (or in very mild districts even February) is favoured. Suitable varieties can be sown earlier where there is sufficient moisture for growth. However, as there is rarely much demand for swedes until late autumn and cool conditions are required for producing the best roots, it is usually advisable to delay sowing, provided the roots are able to make most of their growth before winter.



[*Sparrow*

Tomatoes are subject to many pests and diseases. Sprays containing D.D.T. will control most insect pests and Bordeaux or copper oxychloride sprays will control most fungous diseases.

Good varieties include Laing's Garden and Superlative Table.

Tomatoes

Dwarf tomatoes do not require staking, and usually do not require pruning apart from the removal of a certain amount of leaf to allow the sun to ripen the fruit. In wet seasons they should rest on a layer of straw. All other tomatoes should be given support and pruned by removing the shoots which arise in the angle of each branch as it grows out from the main stem.

Staked varieties can be grown on the single- or double-stem system. One advantage of the double-stem system is that the supporting stakes or wires do not need to be as high as those for plants grown on the single-stem system, though plants should be a little wider apart.

Soil preparation should preferably have been begun some time before planting out. The soil should be deeply dug, well drained, and contain plenty of humus. Addition of a complete fertiliser is usually advisable. It can be dug in or scattered in a furrow taken out with a hoe on the line on which the plants are to be set out and the furrow closed by hoeing the soil back over the fertiliser. Staked plants are usually set out 12in. to 15in. apart in the rows with the rows about 3ft. to 4ft. apart. Dwarf varieties may be set out 2ft. by 3ft., but where space permits it is usually advisable to space them 3ft. by 3ft. or 3ft. by 4ft. Some good varieties were listed in last month's home garden article.

Tomato plants are usually set out toward the end of October, except in parts of Canterbury and some southern districts, where there is danger of frost until about the second week in November. In districts where late blight and stem borer or other caterpillars are troublesome it is advisable to apply Bordeaux (4oz. of bluestone and 5oz. of hydrated lime in 4 gallons of water) or proprietary copper substitute plus D.D.T. The first spray

[Green and Hahn

Curly kale is not grown as generally as it might be in home gardens, but if a good strain is obtained, it is a first-class vegetable for home gardens.

should be applied about 10 days after the plants have been set out in the field. It should be repeated every 2 to 4 weeks, according to the local severity of the disease and the weather, until the crop is fully grown. Bordeaux is not usually necessary in the drier districts.

Plants that show any marked deviation from normal growth should be removed at once. Distortion of young leaves or mosaic mottling may indicate infection with virus, different strains of which vary in the severity of their effect on tomato plants. Those which develop narrow, often distorted, fern-like leaves or have a stunted appearance usually produce little, if any, crop. They should be removed and burnt.

Plants infected with spotted wilt, shown by bronzing of the foliage with a pattern of brown spots toward the bases of leaflets, usually with stunting and rolling and bunching of the top leaves, should also be burnt. Spotted wilt is one of the most serious diseases with which the tomato grower has to contend. It is commonly spread from diseased to healthy plants by thrips, and many garden plants (iceland poppies, dahlias, asters, zinnias, nasturtiums, chrysanthemums, and lettuces) are subject to attack and also serve to carry over the disease from season to season. Regular spraying with D.D.T. is advisable to control thrips, and tomato plants should be set as far away as possible from susceptible ornamentals.

Radio Broadcasts to Farmers

RADIO broadcasts to farmers will be given as follows from New Zealand stations during November:—

1XH Hamilton

14 November (12.33 p.m.)—"Control Measures against the Introduction of Disease", by G. R. Mackintosh, Livestock Instructor, Department of Agriculture, Hamilton.

21 November (12.33 p.m.)—"Problems of the Month", by J. R. Murray, Instructor in Agriculture, Department of Agriculture, Hamilton.

25 November (8.10 p.m.)—"Current Farming Problems", by panel of speakers.

28 November (12.33 p.m.)—"Farming Accountancy", by F. J. Bitton, Federated Farmers.

1YZ Rotorua, 7.15 p.m.

10 November—"Hygienic Production of Milk and Cream", by A. T. Gabolinscy, Special Inspector, Department of Agriculture, Hamilton.

23 November—"Questions and Answers", by S. W. Rees, Supervisor, Bay of Plenty District Pig Council.

24 November—"The Value of Soil Analysis on the Farm", by A. V. Allo, Instructor in Agriculture, Department of Agriculture, Tauranga.

2XA Wanganui, 8 p.m.

3 November—"For the Country Woman", by Mary MacDonald.

10 November—"The Radio Vet.", by S. Jamieson, Veterinarian, Department of Agriculture, Wanganui.

17 November—"Good Stock Pay Better Dividends", by C. M. Baillie, Supervisor, Taranaki District Pig Council.

24 November—"Types of Ryegrass in New Zealand", by A. A. Duncan, Instructor in Agriculture, Department of Agriculture, Wanganui.

3YA Christchurch, 12.20 p.m.

14 November—"Preparations for Winter Vegetables", by L. C. Hurndell, Horticultural Instructor, Department of Agriculture, Christchurch.

4YZ Invercargill, 7 p.m.

1 and 8 November—"Shearing and Preparation of the Wool Clip", by W. F. Dick, Sheep and Wool Instructor, Department of Agriculture, Invercargill. "Fat Lambs", by J. P. Anderson, Veterinarian, Department of Agriculture, Invercargill.

15, 22, and 29 November—"Farming Overseas", by C. D. Denize, Instructor in Agriculture, Department of Agriculture, Invercargill. "Soil Conservation", by B. Burridge, Soil Conservator, Department of Agriculture, Invercargill.

Regular Sessions

1XH Hamilton, Mondays at 12.33 p.m. and Tuesdays at 8 p.m. (Frankton stock market report), Wednesdays at 12.33 p.m. (report from Ruakura Animal Research Station), Thursdays at 12.33 p.m., Fridays at 8 p.m. (stock sale review).

1XN Whangarei, Mondays at 8.5 p.m., Wednesdays at 8.1 p.m. (Northland stock market report), Fridays at 8.1 p.m.

1YA Auckland, Mondays, Tuesdays, Wednesdays, Thursdays, Fridays, 7.45 p.m., and Saturdays at 6 p.m.

1YZ Rotorua, Mondays at 12.33 p.m. (Waikato stock market review), Tuesdays at 7 p.m. (Hamilton stock market report), Wednesdays at 7.15 p.m. (Pig Council talk on fourth Wednesday of every other month), Thursdays at 12.33 p.m. and 7.15 p.m. (fortnightly).

2XA Wanganui, Wednesdays at 8 p.m. (Wanganui stock sale report), Thursdays at 8 p.m.

2XG Gisborne, Tuesdays at 8 p.m., Fridays at 8.2 p.m. (Gisborne stock market report).

2XN Nelson, Thursdays at 8 p.m.

2XP New Plymouth, Thursdays at 8.1 p.m.

2YA Wellington, Mondays at 7.15 p.m., Thursdays at 12.33 p.m., Fridays at 7 p.m.

2YZ Napier, Tuesdays at 12.12 p.m. (Hawkes Bay orchardist session), Tuesdays at 7.10 p.m., Wednesdays at 7.15 p.m. (Hawkes Bay-Poverty Bay livestock market report), Thursdays at 12.33 p.m.

2ZA Palmerston North, Mondays at 12.33 p.m., Fridays at 8.45 p.m. (Feilding stock market report).

3XC Timaru, Mondays at 8 p.m. (Pleasant Point stock market report), Tuesdays (fortnightly) at 8 p.m. (Temuka stock market report), Wednesdays at 8 p.m., and Saturdays at 10.30 a.m.

3YA Christchurch, Mondays at 12.20 p.m., Wednesdays at 7.15 p.m. (Addington stock market report), Thursdays at 12.33 p.m. and 7.15 p.m.

3YZ Greymouth, Mondays and Thursdays at 12.33 p.m.

4YA Dunedin, Mondays at 12.33 p.m., Wednesdays at 7 p.m. (Burnside stock market report), Thursdays at 12.33 p.m.

4YZ Invercargill, Mondays at 12.33 p.m. Tuesdays at 7 p.m.

Faults in the New Zealand Wool Clip

FROM one point of view it can truthfully be said that all wool, whatever its colour or characteristics, is good for some purpose or other. Short, stained locks have their place in the trade on a footing which is not so different from that of the best crossbred or fine wools. This article, adapted from a paper given by A. E. Henderson, Senior Lecturer in Wool, Canterbury Agricultural College, Lincoln, at the Lincoln Farmers' Conference recently, discusses the reasons for there being such large differences in price between kinds of wool if each and all of them have a definite use and are ideal for some purpose or other.

THE price obtained for wool is almost always used as the measure of excellence, and this price is determined first by the demand for and the selling price of the finished article, and secondly by the amount of money the manufacturer has to spend in manufacturing. The farmer is quite right in using price as a measure of excellence, but there must be one reservation. The important thing is the clean price. No-one is paid for grease and dirt, but because nearly all New Zealand wool is sold greasy and the price obtained varies with the amount of grease and dirt, the presence of these things often clouds the issue.

The things about wool that give it excellence are fairly clear to the practical man, though the scientist has great difficulty in defining and measuring them. The things that matter most are: Good length, because it gives strength to a yarn and allows finer yarns to be spun; soundness, because it lowers the amount of short fibre that has to be diverted to fabrics with a lower selling price; colour, because whiteness gives maximum scope for utilisation; well-defined and even crimp, because this is a first-class indicator of evenness of fibre diameter and fibre length within the staple; and good handle or softness, which is most difficult to define but which is most important.

Though all wool can be used, it is to the advantage of a farmer if his wool is among those that bring the higher prices. Fineness, of course, has a very great bearing on price, but this article will be confined to the part played by excellence. How much of New Zealand wool is faulty, what is wrong with it, and finally, what can be done about it?

From a trade point of view it seems that on an average something less than 10 per cent. of fleece wool is classified as "Spinners and Super Topmaking". Wools of these descriptions can be regarded as offering the greatest scope and economy in manufacture and for all practical purposes can be described as free of fault. Sixty to 70 per cent. of the clip is classified as "Good/Average Topmaking", and these wools have various manufacturing limitations. Between 20 and 30 per cent. of fleece wool is described as "Average/Inferior Topmaking", and these wools have serious manufacturing limitations. It is obvious, then, that only a small part of the wool clip is as good as it can be.

Green stain, an effect caused by colour-producing micro-organisms in the fleece. This effect is one of a number which are caused by micro-organisms and which are generally called fleece rot.

Now, what is wrong with this wool? A detailed survey involving more than 80,000 fleeces from all parts of New Zealand has disclosed that apart from short staple length and poor crimp, which in themselves detract from excellence, about 55 per cent. of all fleeces examined had recognisable discoloration or defection. Nearly a third of these fleeces had two or more recognisable faults. It is probably true that the majority of the wool that fails to meet the standard of the 10 per cent. that is graded as "Spinners and Super Topmaking" is too short and lacks crimp or style. It may or may not have other things wrong with it. It is known that feeding has a very great influence on length and style. It can be said, therefore, that if the sheep that produce this average grade wool were better fed, then their wool would be of higher grade.

This statement is so obvious and sensible that it might be thought superfluous; nevertheless it draws attention to a situation that calls for great skill on the part of the farmer, a situation where the farmer has to balance carefully rate of stocking and the levels of per-sheep and per-acre production so that his total farming operation shows the greatest return. No-one doubts that the production of very high-grade wool is expensive, not in cash outlay, but in low rates of stocking and restricted production of other farm commodities. If these restrictions are practised to grow top-grade wool, then there must at the end be a reward; otherwise there is no incentive, and until there is an ensured reward there is little chance of increase in the proportion of super wools in the New Zealand clip.

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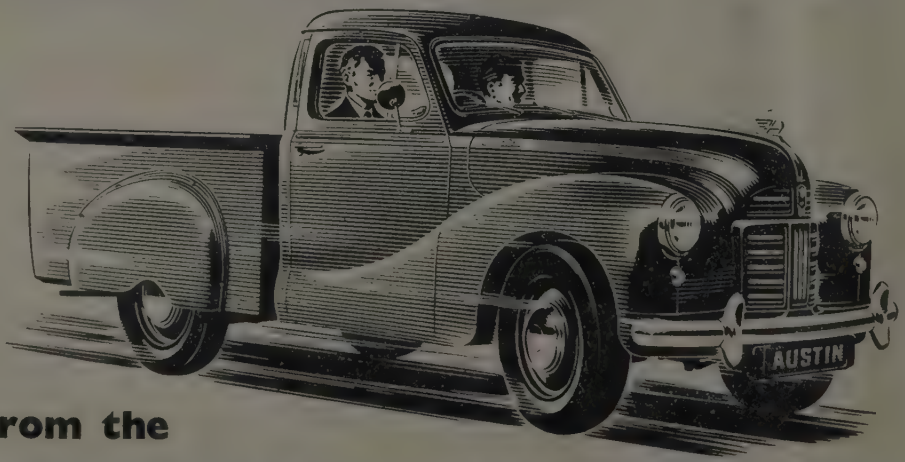

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Wool Break

A fault almost always associated with shortness and poor style is wool break or tenderness, which recognisably affects between 45 per cent. and 50 per cent. of fleeces. From work done at Canterbury Agricultural College by Hart it is clear that light/dark ratios have a profound effect on rate of wool growth. For instance, sheep that remain at constant weight will produce in each of the months of December, January, and February approximately three times as much wool as they will produce in each of the months of June and July. There is little doubt that this low rate of growth in June and July leads to a break. If sheep are well fed in the June-July period, then the amount of wool grown is greater and may reach approximately half the quantity grown in the mid-summer months. It is obvious that good winter feeding will do much to prevent not only the occurrence of break but also shortness of staple and lack of style, which are consequences of a fluctuating wool growth-rate.

Though break is an important defect in itself, it also leads to or sets the stage for the occurrence of other faults. A cotted or matted fleece cannot occur unless there is first a large number of loose fibres in the fleece, and this always happens with the occurrence of a recognisable break; indeed, this is the break. These loose fibres may not entangle to form a mat, but if there is fairly frequent wetting of the fleece, a mat of some sort is likely to form. On an average approximately one in seven fleeces is matted or cotted to some degree. Disentangling the matted mass requires labour and machinery and the process results in much fibre breakage, so that cost of manufacture is increased and the wool fibres themselves have a more restricted use.

Hairy Tip

A point of great interest is the positive association that exists between a fault known as hairy tip and both break and cotting. In other words, these faults tend to occur very frequently in the same fleece. There is a particular association with cotting. Most forms of hairy tip are strongly inherited; therefore judicious selection of breeding stock must influence not only the incidence of hairy tip but also cotting and to some extent break. Among Romney and crossbred sheep one fleece in 13 has a hairy tip. Selection against hairy tip is one of the most worthwhile means by which the average grade of the wool clip can be raised. Unfortunately it is usually almost impossible for selection to be effective. Ewes are culled at a time when they have too little wool to make the fault obvious and rams are almost always offered with the tips of the fleece carefully removed. In these circumstances it requires a very penetrating inspection before a hairy-tipped and potential cotted fleece can be positively identified.

Dinginess

Next in importance, as far as incidence is concerned, is dinginess. In Romney, crossbred, three-quarter-bred, Corriedale, and half-bred fleeces an average of one fleece in 11 can be classified as dingy. The appearance of the fleece is spoilt by the presence of excessive dust or sand or by log or bush stain. These fleeces are never found in the top grades, no matter how well grown and fundamentally good the wool may be. The farmer who produces this kind of wool is perhaps penalised in two ways; first, by a low yield, and secondly, because the greasy wool is very dirty and unattractive to look at.

There are possibly two solutions to this problem. If much of the rough sheep country is to be used at all, then there will always be opportunity for much of our wool to become dingy. Accepting this, one obvious way round the question is to scour this wool before offering it for sale. The wool should then sell on its own merits.

The second solution is a much more intriguing one. In another paper given at the conference Mr. A. A. Urquhart described his success in reducing the incidence of sandy or dingy fleeces in his flock. He has done this by selection, and his selection and breeding policy is based on the recognition of a particular kind of wool. If by appropriate selection methods this particular wool type were to become widespread in our high country—or, indeed, on any dirty country—it could result in one of the most spectacular achievements of the sheep farmer in producing a fleece thoroughly adapted to a particular set of environmental circumstances.

Fleece Rot

To a large extent the work done by Mr. Urquhart has had the same objective as work which is being done at Canterbury Agricultural College investigating fleece rot among fine-woolled sheep; Corriedales, half-breds, and Southdowns. There are many forms of fleece rot, but green, brown, blue, pink, and yellow stains can be listed, with less frequently actual rotting of fibres. The over-all incidence of these faults in the New Zealand clip is not high, and is usually about 5 per cent. However, in some areas and in some seasons a very great number of fleeces may be affected and staining may be serious enough to lower grade very appreciably. At present prices it may cause a loss of about 6d. per pound, so that the problem can be of great significance to some farmers. These faults are the result of wetness within the fleece for periods exceeding at least 3 days on end.

Research has been conducted to discover the reason why some fleeces are never affected by fleece rot, and the stage has been reached where a type of wool that is almost immune to it can be recognised. It has been discovered that such fleeces dry much more quickly than others, but a difference that can be quickly measured has yet to be found. It is of some considerable interest that the fleece type resistant to fleece rot has, as far as can be ascertained, the same features as the fleece resistant to sand, and it is considered, though not yet thoroughly proved, that the desirable fleece type is fairly strongly inherited. It should be possible, therefore, to be successful in selecting for and breeding sheep with this type of wool.

Causes of Wool Faults

There is much more about these individual faults that could be discussed and there are many more minor faults that could be mentioned. However, there are broader issues that deserve attention. It is recognised that only approximately 10 per cent. of New Zealand's wool can be described as very good, and that about 20 to 25 per cent. is poor. Some of the reasons why this wool is regarded as poor have been explained and discussed. At one time or another farmers have probably noticed all the faults that occur in wool, but it is unlikely that they have realised the collective significance of wool faults.

Faults can be divided into a number of categories. There are wool faults that are due to nothing less than carelessness, and it is amazing that such a valuable product should be carelessly handled. There are faults that are due to feeding and management, and these are problems for the individual, for they are associated with achievement of an over-all production efficiency to which wool is only one of a number of contributors. Next, there are faults that have a fundamental cause in breeding, and hairy tip is one such fault to which much more attention could be paid. Fortunately, others such as hairy britch and kempy fibre are fairly efficiently dealt with.

There are faults that are the result of inability of the fleece to look after itself. If all wool remained as good as when first produced, the wool clip would grade a great deal higher than it now does. A fleece is important in two ways. First, it is necessary for the well-being of the sheep, but it should not be so large and cumbersome that it interferes with the sheep. Secondly, it is part of the farmer's reward, and it is he who requires it to be large and of high grade. The less effort the farmer has to make in achieving these things the more profitable is the farming operation.

The weather and rough country are the worst enemies of a fleece, and little can be done about altering either. The solution, therefore, is to look for and

select and breed a type of fleece that can withstand the bad effects of either or both of these natural hazards. This will not be easy, but it has become apparent that it can be done in Merinos and in half-breds and Corriedale. There is good reason to believe that it can also be done among Romneys and crossbreds.

It should be clearly understood that this involves breeding a type of fleece particularly suited to certain climatic or other environmental circumstances. It is the chief aim of any farmer to have the kind of stock that will thrive best on his country. This is right and proper, but illogical argument is too often used when a choice of strain or breed is being made. Because wool is easy to see, the kind of wool a line of sheep has often governs the choice. It is true that on a broad basis physiology and behaviour are associated with kind of wool, but it is not true that kind of wool confers on the sheep some particular ability or other, because within breeds fine or coarse or long or short wool, or any other fleece characteristic for that matter, contributes little or nothing to the ability of the animal itself to thrive. It follows, then, that within a breed selection for a kind of fleece can be practised independently of selection for other physical features.

Lastly, attention is drawn to a fairly general cause of mediocrity in wool. There are some who judge productivity of their sheep by the amount of wool they produce rather than by the amount of money that is obtained for the fleece. On the average, coarse fleeces are heavier than fine fleeces and the difference is usually about a third of a pound for one count change. In round figures a 52's fleece of 10lb. is worth as much as a 46's fleece of 11½lb. and a 58's fleece of 9lb. is worth as much as a 50's fleece of 12lb. If the significance of these figures is forgotten, then there is a great preference for the coarser-woolled sheep of any breed.

In addition, there is a fairly widespread practice of selecting flock rams having a kind of wool one would like to grow, and often preference is given to a coarse, bold type of fleece. For various reasons, most of them technical, a bold, coarse wool of any breed requires a very high level of feeding and management before it can hope to be good enough for the higher grades. On the other hand, the finer wools of any breed, provided they are not fuzzy or spongy, will retain style and appearance under hard conditions, and these are things associated with the fleece itself, not the sheep. It is advisable, therefore, that selection of coarse wools be avoided unless conditions are such that sheep can be consistently well fed and heavy fleeces can be produced.

Effect of Growth Inhibitors on Pasture

IN view of the proposed use of the growth-inhibiting substances maleic hydrazide and I.P.C. in controlling docks and barley grass respectively two trials were carried out, one in 1952 and one in 1953, at the Department of Agriculture's Invermay Research Station to test the effects of these materials on pasture. In this article N. A. Cullen, Research Officer at the Station, and E. R. Dearnley, Research Statistician, Department of Agriculture, Wellington, discuss these trials and the results obtained in them.

M.H.30, the diethanolamine salt of maleic hydrazide, was applied in the trials at rates equivalent to 2½lb. and 4½lb. of maleic hydrazide per acre in the 1952 trial and at equivalent rates of 3⅜lb. and 4½lb. in the 1953 trial, in each case in 100 gallons of water per acre. No wetting agent was used. I.P.C. was applied at ½lb. and 2lb. carbamate equivalent per acre in 1952 and at 2lb. and 4lb. in 1953. Both trials were laid down in the one field carrying a good ryegrass pasture with red and white clovers subdominant. Treatments were applied on 15 October in 1952 and on 24 September in 1953; that is, in the period of early spring growth.

Results of 1952 Trial

No results were seen for 2 weeks in the 1952 trial, though a cut taken then showed that production from treated plots had already fallen to 90 per cent. of that from untreated. Immediately afterwards a marked inhibition of grass growth was observed on the M.H.30 plots, with a less effect on plots receiving 2lb. of I.P.C. Growth on treated plots was only ¼in. to 1in. per week, but growth on untreated plots averaged 2in. Clovers were much less affected and recovered rapidly.

One month after application M.H.30 was still giving severe inhibition and appeared to have killed some ryegrass at the higher rate, though at the lower rate the grass was making a good recovery. Only a slight check was to be seen from 2lb. of I.P.C. The inhibition from M.H.30 continued for another month but then wore off; 3½ months after application it had ceased to be seen, and after 4 months plots treated with M.H.30 were actually producing more green herbage than those which had not been treated. This was probably due to an increase in clover growth and was not seen in the trial in the second year.

Results of 1953 Trial

By 3 weeks after application in the 1953 trial plots treated with I.P.C. were showing very severe inhibition, production of green herbage being only 50 per cent. of that on untreated plots. This effect was principally on grasses, clovers showing much less effect. There was some burning of red clover, but this was probably due to the solvent used. M.H.30 plots were then showing only slight inhibition.

Six weeks after application there was a pronounced effect on all treatments, herbage on M.H.30 plots being only 50 per cent. of that on untreated plots, and for I.P.C. the proportion was 40 per cent. at the 2lb. rate and 25 per cent. at the 4lb. rate. Some distortion was seen in clovers, red clover being affected more than white clover. Mature grasses were recovering fairly well, but some young plants and seedlings were killed.

By 10 weeks most effects had worn off but the area treated with 4lb. of I.P.C. was still showing a considerable effect, and this was still visible even 8 months after application. Cocksfoot recovered better than ryegrass and replaced it to some extent. The inhibition of grass growth caused a marked growth of clover.

The extent of these effects is shown by the following table, which shows the percentages of the principal constituents in green herbage 8 months after application for the most affected treatment and the untreated area:—

PERCENTAGE OF HERBAGE

	Ryegrass	Cocksfoot	White clover	Red clover
Untreated ..	32	18	7	35
I.P.C. at 4lb.	20	23	16	35

M.H.30 at 4½lb. of maleic hydrazide equivalent per acre gave a marked suppression of grass for about 2 months, though the effect was much less at lower rates. I.P.C. at 2lb. per acre gave a marked suppression and at 4lb. per acre a very drastic one; the optimum rate may lie between these figures. Clovers were slightly affected by M.H.30 directly and by I.P.C. only indirectly by burning with the solvent used in the I.P.C. formulation. The regrowth of white clover, which compensated for the loss of ryegrass, ensured that the total herbage yield for the year was only slightly altered.

However, the differential effects on grasses, cocksfoot recovering better than ryegrass, and the spread of clover at the expense of ryegrass would upset the pasture balance to a possibly undesirable extent. The same difference in sensitivity renders it inadvisable to use these materials on lawns containing more than one species. In a mixed browntop-chewings fescue lawn, for example, maleic hydrazide will give a replacement of the more susceptible browntop by the less susceptible chewings fescue and will also encourage the spread of the undesirable clovers. For controlling growth on the edges of the lawn and other places where disfigurement would not matter growth inhibitors may have value.

Honey House Wagon

By L. H. JOHNSON,

Apiary Instructor, Department of Agriculture, Palmerston North

NEARLY every beekeeper has a conveyance of some kind for moving heavy supers of honey from the motor truck to the extractor and cases of the finished product from the honey tanks to the store room or the dispatch platform. Whatever the make of trolly, bogie, truck, or barrow used it serves best when put to the job for which it was designed. There does not appear to be any wheeled conveyance sufficiently versatile to do any job under all conditions. The honey house wagon described and illustrated in this article is designed primarily for use on concrete floors all of which should be at ground level and have smooth, even surfaces without any steps.

THE wagon must be loaded manually, but it is very useful in circumstances where many of the automatic pick-up hand trucks and bogies are unsuitable for loading on or off a motor truck at ground level. The deck of the wagon is at a convenient height so that there is no lifting from the ground. This avoids the extra strain put on the back muscles when heavy goods are handled to and from floor level.

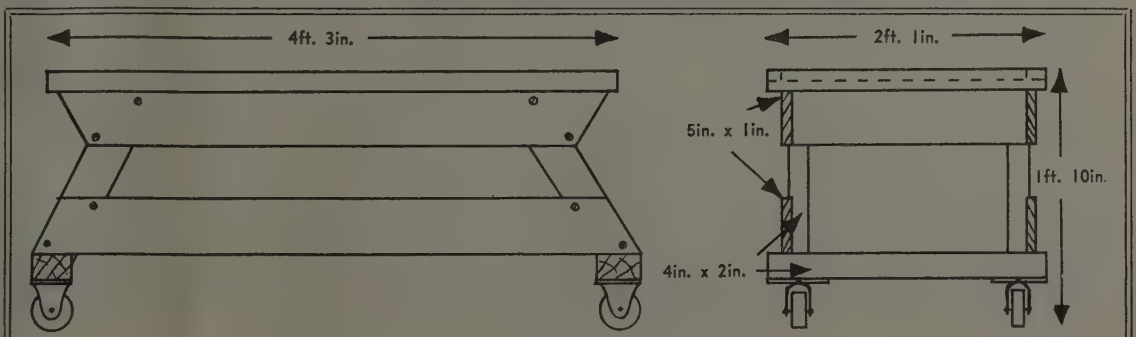
The wagon is simple and economical to make. The cost was £9 3s. 6d. It is ideal for moving any heavy kind of goods or appliances used in a honey house. A load of 9 supers with combs full of honey is comparatively easy to move and steer to where required.

Upper—Honey house wagon. Lower—Wagon loaded with 10 60lb. tins of honey.

Simply and Sturdily Built

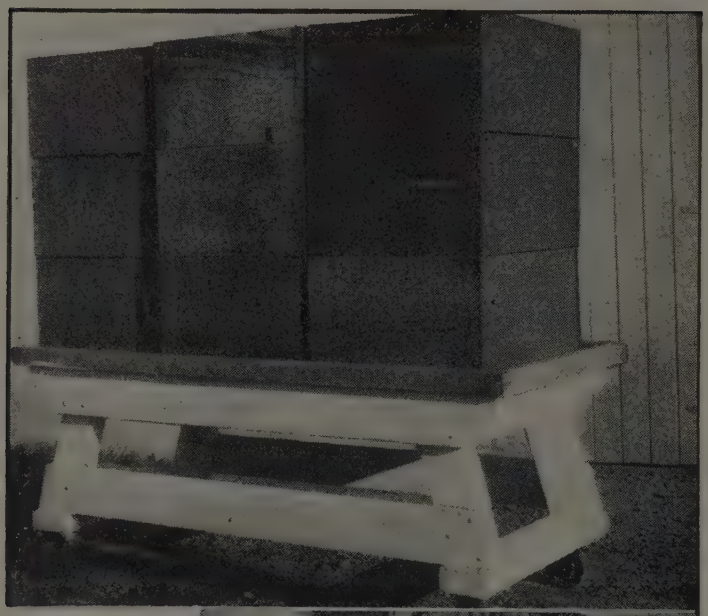
Timber used for the bottom bearers and uprights is 4in. x 2in. The lower side runners and top and end bearers may be made of 5in. x 1in. To ensure that there is no racking of uprights or downward drifting of bearers these should be notched into the uprights and secured with ¼in.-diameter coach bolts.

Decking of 1in.-thick timber should be fixed crosswise on top.



Side (left) and end views (right) of honey house wagon.

HONEY HOUSE WAGON



Above—The wagon described in this article loaded with 6 supers full of combs of honey. At right—A wagon that is too near the floor, does not hold enough, and, being so dumpy, is hard to steer.

A drip tray of tinned steel may be made to the dimensions of the top with the metal extending over the margins and down the outside to cover the ends of the decking.

Heavy industrial-type plate castors with 3¾in.-diameter wheels may be fixed to the undersides of the bearers.

Finally, the woodwork should be given three coats of paint.

Uses

In addition to moving heavy supers of honey the wagon can save time and labour in the honey-packing room. Instead of a table or the floor being used cartons and boxes of tinned honey may be stacked on the wagon, the whole load then being mobile and capable of being moved to any part of the building where it is required without double handling.

Other equipment, such as a honey tank or a cappings melter, can be put on the wagon and moved to any part of the building. Beekeepers using this type of wagon are pleased with its usefulness.

Efficient Haymaking

NOT only is good hay a valuable insurance against summer drought and winter shortage, but the systematic saving of hay increases farm production by ensuring the efficient control of grass growth. Good hay cannot be made from poor pastures and the grass must be cut at the right time and must be properly cured. In addition, good hay will rapidly degenerate into bad hay unless it is efficiently stacked and protected from the weather.

Time to Cut

The main crops for hay are lucerne and pasture. Lucerne should be cut when about a third of the crop is in flower. If it is left later than this, the hay will contain a large proportion of tough, useless stalks and there will be a greater loss of leaf. Mixed clover and grass pastures should be cut when the main grass is coming into flower. Pure clover stands are ready when the clover is in full flower.

Good hay requires vigorous, quick-growing pastures, and to achieve this the pasture should be bare-grazed with a large quantity of stock in a short time before it is shut up. It should be harrowed well and topdressed with 2cwt. of superphosphate and potash if this has been found to be beneficial. In a late season 1cwt. of sulphate of ammonia will ensure a quick start and heavy leafage.

Curing and Storing

The making of good hay is dependent on the weather, and once the weather is right no time should be lost in cutting, curing, and storing the crop. The best conditions for curing are a dull, windy day, as strong sunlight tends to dry the crop excessively and results in loss of leaf, colour, and quality. If the crop is cut in the morning, the swath should be lifted and turned first in the afternoon of the same day. An afternoon cut should be turned the following morning.

With this treatment and windy conditions the hay should be ready to bale 2 days after being cut. Lorries should be organised to remove the bales while the baler is still operating, as a heavy shower on new bales can undo all the good work previously done. The bales should be stacked in a shed if possible or else on a good foundation and well covered.

—*H. de O. CHAMBERLAIN,*
Instructor in Agriculture,
Department of Agriculture,
Gisborne

Turkey Raising

THOUGH the raising of turkeys does not form a substantial part of the poultry industry in New Zealand, interest in raising turkeys successfully for the table is increasing as indicated by inquiries received by the Department of Agriculture from time to time. This article by the Animal Industry Division reviews the position of turkey raising in this country, describes the breeds or varieties of turkeys, and discusses turkey breeding.

A flock of Mammoth Bronze turkeys. The birds are approaching the stage at which breeding stock is selected and the remainder of the flock is killed for market.

THERE is no evidence that turkeys have been raised in large numbers in New Zealand and on a scale comparable with that of countries where considerable attention is given to poultry keeping. A possible explanation may be that the consumption of turkey for Christmas dinner has not become customary to the extent long established in countries in the Northern Hemisphere. In Britain, for instance, turkeys hatched in spring reach prime condition in December and are a great attraction for the Christmas market. In New Zealand on the other hand turkeys reared in spring reach the killing stage in April and May and have to be placed in cold storage if required for Christmas. Great prominence is given to turkeys in shops at Christmas time in Britain and in consequence there is wide interest in turkeys at that time.

Census figures in New Zealand show that the highest number of turkeys was recorded in 1911, when there were approximately 98,000 birds. Numbers dropped during the First World War, but recovered to 80,000 in 1936. During the last war there was again a drop to 37,000, but the total has since increased, being 50,000 in 1951. Census figures bring out a further interesting point, namely, that over the years a large proportion of the turkeys (as high as 70 per cent.) have been raised in the Auckland Province. There appears to be a steady demand for turkeys in this area, possibly owing

[*Robertson*

A mass-mated breeding pen of Mammoth Bronze turkeys on free range.

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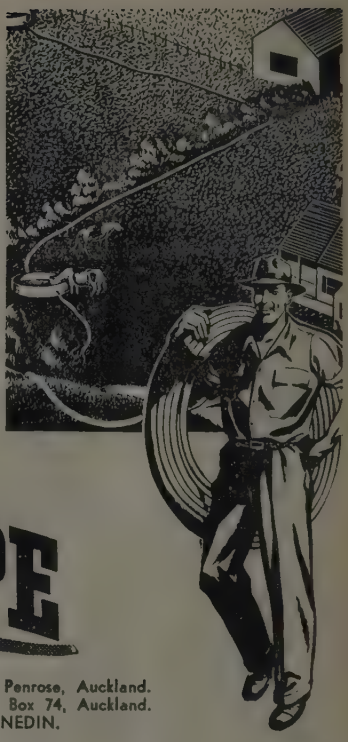

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to an appreciable extent to orders received from overseas ships calling at Auckland.

New Zealand cannot be said to have organised commercial turkey production. A high proportion of the birds come from small flocks, though a few commercial units have been established in recent years. There appears to be no reason why turkeys should not be raised in quantity quite successfully in New Zealand, but those considering commercial turkey raising will be well advised to explore the possible avenues of disposal before embarking on this type of enterprise.

If the consumption of turkey meat is to be increased in New Zealand, attention will have to be paid to encouraging a more general interest in it. Consideration will also have to be given to marketing of moderate-sized or small birds, as large turkeys are too big for the average family today and because of their price are unlikely to be bought often.

Breeds

Several breeds of turkeys have been developed overseas for commercial turkey production, but breeders in New Zealand are confined at present to the use of the breed already established here, the American Mammoth Bronze. This is one of the oldest varieties of turkeys and one of the heaviest. It has been popular in turkey-raising countries for many years, but is now being superseded to an appreciable extent by breeds which are smaller, quicker maturing, and carry more breast meat. Mammoth Bronze males may weigh 30lb. or more and females 16lb. when fully mature. This means average killing weights of 20lb. to 25lb. in males and 12lb. to 14lb. in females. Mammoth Bronze hens are classed as moderate layers, giving about 40 to 60 eggs during the hatching season. Strains vary considerably in regard to broodiness, which can be a problem and is a weakness which should be guarded against when breeding stock is selected.

Mammoth Bronze turkeys have dull black feathers with a rich bronze hue over the surface. Some body and tail feathers have a white lacing. The bronze shading is more noticeable in the males than in the females, but otherwise the two sexes are alike in colouring.

At present there is an embargo on the importation of all live turkeys or hatching eggs from overseas, except for turkey hatching eggs from Australia. This embargo is in force for the purpose of protecting the poultry industry against the introduction of any highly infectious diseases such as fowl pest and infectious laryngotracheitis which have so far not been reported in New Zealand. As the time may come when there will again be importations of fowls and turkeys reference will be made to some of the breeds of turkeys which are being raised commercially overseas.

Fixing a canvas saddle pad or cover on a breeding female turkey.

Broad Breast Bronze

The Broad Breast Bronze, which originated in England and has been developed in America over the past 20 years, is similar to the Mammoth Bronze in appearance, but lacks much of the bronzing of the latter variety and has less white lacing to the feathering. The distinctive characteristic of this variety is the muscular development on the breast, which gives an extremely plump bird carrying a high proportion of lean breast meat.

This variety has become particularly popular in America. Birds are heavier than those of the Mammoth Bronze breed, males under a year old weighing about 32lb. and females 18lb. The rate of maturity is similar to that of the Mammoth Bronze, but average egg production and hatchability are poorer.

Norfolk

The Norfolk is known also as the Norfolk Black or in America as the Black. This turkey is black with a lustrous green sheen. It is a medium-sized bird which is popular in England. Males average about 14lb. to 20lb. and females 10lb. to 14lb. It is noted for its fine texture of flesh, which is white. The hens usually lay well. The Norfolk is a good breed where first-quality birds of medium weight are required.

Beltsville Small White

The Beltsville Small White is a small breed of turkey which was developed by the United States Department of Agriculture at Beltsville by pedigree breeding and selection. The breed was developed to produce a small-bodied bird suitable for the retail trade to the public. It was selected for a broad-breasted characteristic and quick maturity, being reputed to mature under good management 2 to 4 weeks earlier than heavier varieties.

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Breeding

In New Zealand at present turkey raisers are unable to exercise any selection of breed. This is not of any appreciable economic disadvantage, provided the price per pound received is similar for large or smaller birds. Under these circumstances it is profitable to breed one of the large varieties such as the Mammoth Bronze.

However, if at some time importations are permitted, attention might well be given to the Beltsville Small White turkey as a means of increasing sales to the public and thus being less dependent on the present trade with shipping and hotels.

As with fowls there is no best breed of turkey for egg production, so that attention to selection and breeding of a strain is more important than selection of a breed. The success with which a strain is established will be in direct proportion to the care and work given in the selection of the breeding stock. Though the type of bird is important in selection, the breeder will benefit greatly by paying attention to egg production, fertility, and hatchability. Rate of maturity, too, is important, because it must affect the economics of production.

Choice of Stock

Thus the choice of foundation stock is important and care must be taken when both males and females are selected each year. The initial selection of breeding stock each year can be from the flock of turkeys immediately before the killing season. This permits a choice from a large number of birds, the best developed and most vigorous being retained for breeding.

The body conformation of breeding stock is important. The body should be compact and meaty. The breast bone should be straight and the back broad and running almost parallel with the breast bone. The body should be deep with a broad, full breast which carries plenty of meat. If a bird is held up by the legs and is relaxed, the breast bone should extend well back between the legs. It is also essential for breeding birds to have a normal, easy gait with an upright carriage. The shoulders should be carried above the tail level. Health and constitution are of the utmost importance in turkey breeding stock.

With the above characteristics in mind the breeder can select birds of both sexes of weights considered desirable for the trade being served.

Age and Size of Matings

Opinions differ about the age at which turkeys should be used for breeding. In practice, however, there appears to be insufficient evidence to condemn the policy of mating young birds, provided they are fully developed and show all the indications of good constitution. On average a greater number of eggs, with better fertility and hatchability, will be obtained from young breeders than from second-season birds.

It is common practice in America, where vast numbers of turkeys are raised annually, to use first-year birds for breeding. Obviously if special breeding work is being carried out and it is known that certain females or a male are superior in type for production or in hatchability, such birds may well be used for several seasons to get the maximum number of progeny to retain for future breeding. However, where birds are to be bred and raised for killing there is no objection to the use of young or first-season males and females.

For commercial production of table birds it is usual to mass mate the turkeys. In New Zealand, where the breed, the Mammoth Bronze, is a heavy one, one male or tom can be mated to 15 or 16 females.

After the turkeys have been selected for mating they should be blood tested for pullorum disease. Selection of birds for breeding well ahead of the breeding season and early mating are highly desirable. Failure to do this can lead to excessive infertility early in the hatching season.

Where the male birds are heavy, as is typical of the Mammoth Bronze variety, females should be protected by the use of canvas saddle cloths. These are fixed to the back of the female by tapes round the shoulders and prevent the back being lacerated by the toe nails or spurs of the male. This may not be necessary with lighter toms, particularly if the toe nails and spurs are trimmed with a pair of secateurs or by an electric debeaker for toe nails.

Management of Breeding Stock

The system of allowing breeding stock unlimited free range and only rough shelter with little or no proper management care is outmoded. Far better results are obtained by giving birds proper management and sanitary conditions.

Housing need not be elaborate, but should provide dry conditions and adequate space. Fixed housing can be used, but there is much merit in having housing which can be moved to fresh ground from time to time. Turkeys should be provided with approximately 4 sq. ft. per bird. Perches must be strong (made of timber not less than 3in. x 3in.) and can be 2ft. apart and 2ft. from the floor. As with those for fowls the perches should be movable so that a check can be kept for the possible presence of red mites. Each turkey should be allowed 15in. of perching space. Housing for breeders should be placed on sloping, well-drained ground where greenfeed is growing.

Nest boxes may be inside the house or outside in a sheltered position. Nest boxes in a house should not be less than 24in. square and should be well filled with soft nesting material to prevent eggs being broken. This material should be watched and kept clean if lice and fleas are not to become troublesome. Outside nesting facilities should be in a quiet position, as turkeys prefer a secluded site for laying.

Where more than one breeding flock is kept flocks should be kept apart in runs with 6ft. wire netting fences. If runs adjoin, the bottom of the dividing fence should carry sheets of iron, sacking, or some other suitable material so that the toms in one pen do not distract and attempt to fight the males in the next pen. Breeding turkeys when penned can be run at approximately 60 birds to the acre for a breeding season.

Artificial Lighting

In America artificial lighting is used to induce early and consistent egg production. As is done with fowls 40- to 60-watt lamps with metal reflectors are placed 6ft. to 7ft. above the floor. Up to 14 hours of natural and artificial lighting are given to the breeders, the electric light being brought on at approximately 4 a.m. Regularity in artificial lighting is essential once it has been started. As the days become longer the artificial lighting should be reduced gradually and finally discontinued. Cutting off lighting suddenly will affect egg production adversely.

The use of lighting is more important in cold climates than where winters are comparatively warm. As a guide to the number of lamps needed in houses where a sizable flock is in one building 1 watt should be allowed for each turkey, that is, 1 watt per 4 sq. ft.

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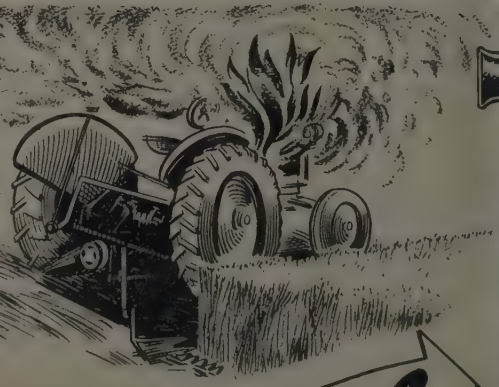

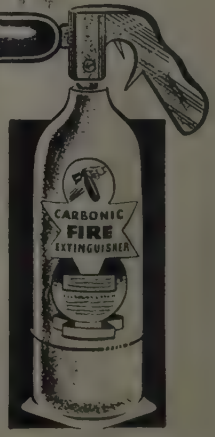

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Saving of Ryegrass and Clover Seed

THE saving of grass and clover seeds provides considerable income on many mixed arable farms. Some simple rules which should be followed by those who make this a regular or semi-regular practice on their farms are set out in this article by W. R. Lobb, Instructor in Agriculture, Department of Agriculture, Oamaru.

RYEGRASSES

WITH the saving of ryegrass seed, whether perennial, short-rotation, or Italian, the sown mixture should be simple and a high grade of certified seed should be used. Stands should be sown on a fallow, preferably after a restorative crop, and for seed production they should be sown without a cover crop. Only clean, vigorous, first-harvest stands of ryegrass should be harvested for seed.

Areas should be closed early enough to allow vigorous early leaf growth, the aim being to have sufficient growth to lodge the stand just after flowering. Grazing before closing should be even, and a high concentration of stock just before closing might be desirable so that all plants come away at the same stage of growth and flowering over the whole stand will occur at the same time.

Use of Nitrogenous Fertilisers

In a backward spring grazing is generally prolonged and, in any case, growth tends to be retarded. In such circumstances the use of nitrogenous fertiliser is strongly recommended. Nitro-lime should be used where there is no evidence of sulphur deficiency, but if there is a sulphur deficiency, consideration should be given to the use of sulphate of ammonia. The use of 1cwt. to 2cwt. per acre when the stand is shut up can be considered.

In a very favourable spring under reasonable conditions of fertility nitrogen may not always be beneficial, as it can induce too much and too vigorous growth too early. The stand may then lodge at or before flowering and very light, unfilled seed can result. The effect, too, may be disastrous on the subsequent pasture, resulting in a complete smother of the clovers.

On paddocks from which seed is saved, subsequent damage by grass-grub and porina caterpillar is enhanced, so that such stands should receive an application of D.D.T. superphosphate in late winter before closing.

Blind Seed Disease

First-harvest stands and stands which lodge are generally more free of blind seed disease than others. Nevertheless it is good practice to have a test made for the disease just before cutting.

Stands which are lodged do not present the same urgency for cutting

It is important to obtain both bulk and flower in white clover crops. However, the harvesting of short crops can be facilitated by the use of windrow attachments (above) or broom pick-ups.

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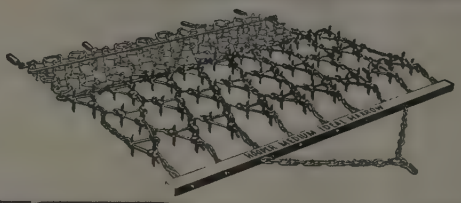

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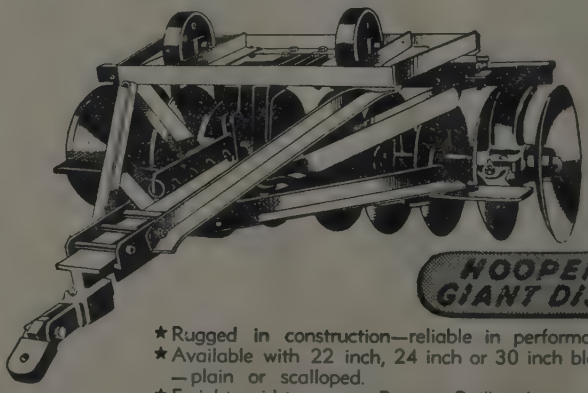

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as thin, standing crops. Yet many crops are cut too soon, especially short-rotation and Italian ryegrass crops, which are difficult to harvest, and in most instances much seed is lost at harvest. Under almost perfect conditions perennial ryegrass requires at least a week to ripen in the windrow, and generally 10 days or even longer is advisable for short-rotation and Italian ryegrasses. Once windrows have become wet, seed loss is inevitable, but the most successful way to recondition the swaths is to cut under them with the mower rather than to use the aerator or swath turner.

Mixtures for grass seed crops should be simple and the companion clover should always be of a high grade of certified white clover so that a white clover seed crop can be taken as the second harvest. Red clovers should not be used, as even with late autumn sowings they can become very troublesome just at the time for harvesting the ryegrasses.

Ryegrass paddocks should be cleaned up immediately after harvest. The baled straw of short-rotation and Italian ryegrass is quite valuable cattle fodder.

WHITE CLOVER

Generally white clover seed harvesting should follow a first-harvest crop of ryegrass. Any one of the ryegrasses is suitable as a companion plant for white clover, with, perhaps, a slight advantage in favour of Italian and short-rotation ryegrasses. The mixture should therefore again be simple.

Management is important, but the greatest factor governing the successful saving of white clover is probably the weather. With the introduction of mowers which will virtually shave the ground, the difficulty of obtaining sufficient bulk together with a heavy setting of seed may not be as great as formerly. Where fertility is very high and in a good growing summer white clover seed is difficult to harvest. The best conditions are medium to poor fertility where fertilisers can be relied on to give good responses. If the stand has been previously saved for ryegrass, it is not so difficult to keep the grass growth controlled in spring, as it will have lost some of its vigour in producing the seed crop.

Management

A paddock from which white clover is to be harvested should be kept close grazed during winter and should be fairly heavily grazed in spring so that at no stage does growth get away from the stock or become grazed in patches. The intended seed production area should be grazed until the white clover buds appear on the closely grazed clover plants. These are small green buds and unless a very careful watch is kept for their appearance they will not be observed. As soon as they make an appearance the stand should be closed. It will then rush away to flower growth and should produce sufficient bulk to handle.

Continued wet weather during summer may induce further leaf

New-type mowers can cut very short crops and it might be possible to adapt them for the harvesting of white clover seed.

A very short, well-seeded clover crop is being cut with the mower shown at the bottom of the previous page. The camera case is lying in the cut swath.

growth and a second flowering, which makes for difficulties. However, when the bulk of the seed is ripe the stand should be cut. Under no circumstances should cutting be delayed until the last flowers have disappeared. Fine, hot weather at harvest is a big advantage, but if the stand has to be dried out, undercutting is frequently successful. Seed discoloration occurs if bad weather prolongs threshing.

Though it is desirable to have white clover areas free from suckling clover, the presence of this clover should not always be taken as an indication that the subsequent purity of the seed will be low. It is very difficult to assess from the presence of suckling clover in the paddock the amount of the seed there will be in the line.

Areas intended for seed should receive a dressing of 1cwt. to 2cwt. of superphosphate in late winter. If protection against grass-grub has not already been made, D.D.T. superphosphate should be used. Fertiliser treatments can be liberal, as bulk as well as flower is of some importance in white clover stands. Various mechanical attachments to harvesting machinery, such as windrow attachments and broom pick-ups, assist in the saving of this crop.

RED CLOVER

Red clover seed production is relatively the most simple, but is dependent on natural factors to a larger extent than is the production of other seed crops. Seeds mixtures can be most complex, as red clover flowers late and at harvest will dominate other grasses or clovers. Perhaps the greatest difficulty is to delay the flowering to coincide with the presence of the bumble bee, which is the most efficient of the pollinating agents. Weather at time of flowering is also important.

With cowgrass (broad red clover) it is usual to take the first growth for hay. With Montgomery red clover grazing should continue in favourable years into December, though this practice varies with the district. In colder southern areas earlier closing is common and possibly desirable. In areas of low rainfall and hot summer temperatures the period of growth in autumn between closing and flowering can be short and late closing is usual. Unless the weather is favourable and bees are numerous, seed setting can be disappointing.

Repeated harvesting of seed stands is not recommended, as yields tend to decrease sharply. Areas of medium fertility which respond to fertiliser are favoured for seed production. Protection against grubs is important.

Direct Heading

Red clover crops are generally direct headed, though in early seasons followed by late autumn rains second growth can be a serious problem and frequently necessitates windrowing. Once the stand has been cut the quantity of seed saved depends on the harvest weather. Stands which have not deteriorated with second growth can be left uncut to dry out in winter, when frost cuts back leaf growth, and though harvest hours are short, seed from these stands can generally be saved.

Exposure to high winds will strip the cobs and lower yields. Some attention to header settings is necessary to avoid damage to seed, and threshing conditions can vary from hour to hour under the conditions in which red clover is usually harvested.

Certification of Legume Cultures

CERTIFICATION of legume cultures for the inoculation of red, white, and subterranean clovers and lucerne is being undertaken by the Plant Diseases Division of the Department of Scientific and Industrial Research. The object of certification is to ensure that users are able to select cultures of proven efficiency.

Legume cultures offered for certification will be rigorously tested and those which are up to standard will be officially approved. The Director of the Plant Diseases Division must be satisfied that a manufacturer is equipped to maintain and produce cultures.

The manufacturer or his agent must state clearly on the label on each container and in advertising the legume or legumes for which the culture is recommended, a date after which the culture should not be used, and the conditions for storage and use. Labels or advertising for certified products may mention that the cultures have been certified. A list of certified products will be published each year.

Application forms for certification or recertification may be obtained from the Plant Diseases Division of the Department of Scientific and Industrial Research, Private Bag, Auckland. Applications should be submitted in duplicate.

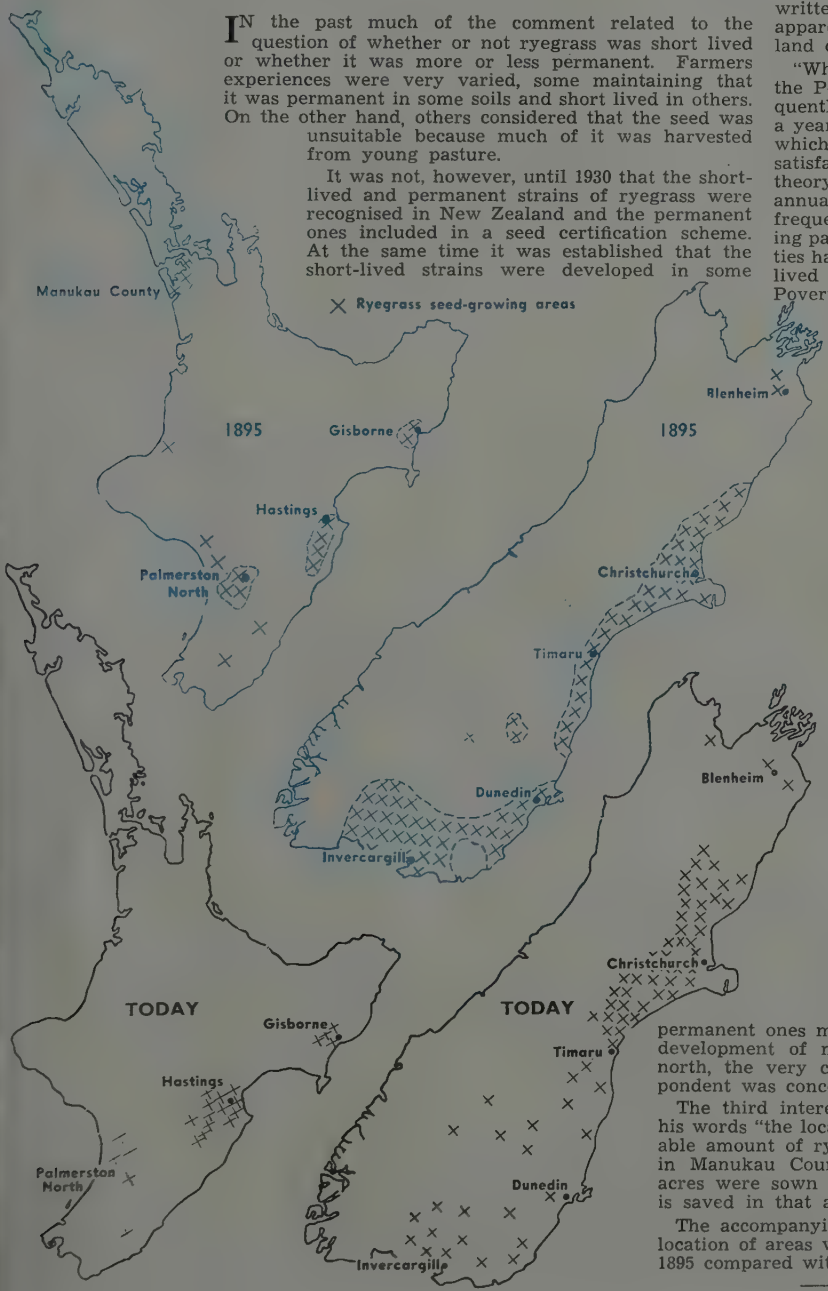
Ryegrass Strains 60 Years Ago

By S. H. SAXBY,
Agrostologist, Department of Agriculture, Wellington

THE value of perennial ryegrass as a pasture plant has been the subject of comment for many years and will doubtless continue to be so for years to come. Comment of 60 years ago quoted in this article makes interesting reading.

IN the past much of the comment related to the question of whether or not ryegrass was short lived or whether it was more or less permanent. Farmers experiences were very varied, some maintaining that it was permanent in some soils and short lived in others. On the other hand, others considered that the seed was unsuitable because much of it was harvested from young pasture.

It was not, however, until 1930 that the short-lived and permanent strains of ryegrass were recognised in New Zealand and the permanent ones included in a seed certification scheme. At the same time it was established that the short-lived strains were developed in some seed-producing districts, particularly in the arable districts of the South Island, largely through the intercrossing of Italian and perennial ryegrass, which were frequently sown in the same mixture.



The following extracts from a letter to the editor published in "The New Zealand Farmer" in June 1894 are of considerable interest. The letter was written by Mr. C. P. W. Longdill, who apparently was a farmer in the Auckland district:—

"Why ryegrass stands for decades in the Poverty Bay district and yet frequently does not stand for more than a year on Northern soils is a question which does not appear to have been satisfactorily solved. . . . My own theory is that Italian rye, which is an annual, and perennial rye have been frequently sown in the same or adjoining paddocks, and that these two varieties have crossed and produced a short-lived variety, and that if the genuine Poverty Bay rye were sown on the good land of the Northern districts, it would not die out like the locally grown article."

There are three interesting comments in these extracts. The first is his reference to Poverty Bay ryegrass. It is apparent that at that time there was a fairly widespread opinion that "Poverty Bay ryegrass" was superior to that from other districts. It is interesting that reference is made to "Poverty Bay ryegrass" and not to "Hawke's Bay ryegrass", because in 1930 it was found that the ryegrasses from both Poverty Bay and Hawke's Bay were permanent strains. Why there was discrimination in favour of the Poverty Bay ryegrass is difficult to ascertain, because ryegrass seed was being produced in both districts at that time.

The second interesting comment is the correspondent's "theory" about the origin of the short-lived strain, which was some 35 years later found to be present in New Zealand and to have originated in exactly the manner propounded by him. The sorting out of the strains of ryegrass about 1930 and the certification of the permanent ones marked the turning point in the development of much of the poor land of the north, the very country with which the correspondent was concerned.

The third interesting comment is contained in his words "the locally grown article". A considerable amount of ryegrass seed was then produced in Manukau County, where in 1895 about 5700 acres were sown down. Today no ryegrass seed is saved in that area.

The accompanying maps show the approximate location of areas which produced ryegrass seed in 1895 compared with those that produce it now.

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LUCERNE-GRASS MIXTURES

LUCERNE is a plant of high potential value, not only because its yield is high and its quality of herbage is good, but also because it will produce during the driest summer months. In the past it has been regarded almost wholly as a forage plant for hay or silage. In more recent years, however, it has been proving its worth as a grazing plant, and in conjunction with various grasses or as part of a seeds mixture it has produced good results.

COMPANION PLANTS

TO make the best use of lucerne's potentialities mixtures in which lucerne forms the greatest proportion of the seed sown should be used and companion plants should be chosen which, though sufficiently vigorous to suppress weeds, do not do so at the expense of the lucerne. Ryegrass has been tried, but has proved too aggressive, cocksfoot is quite satisfactory under certain conditions, and meadow fescue and timothy are less aggressive than cocksfoot.

Though lucerne is not a good competitor as a sward constituent, especially during the seedling stages, once it is fully established it competes with the other ingredients as long as the sward remains fairly open.

DEPARTMENTAL TRIALS

Thirty-six trials with lucerne-grass mixtures are in progress or have recently been concluded. The majority of these are on light land or tussock country. There is a small group of trials where lucerne has been oversown in a seeds mixture for control of nassella tussock. After the nassella had been burnt lucerne-grass mixtures were oversown with and without harrowing. Some small success has been achieved here, as lucerne seems able to establish on a fairly heavy cover better than grasses, which prefer a prepared surface with less cover.

The main grasses tried with lucerne so far are cocksfoot, *Phalaris tuberosa*, timothy, and meadow fescue. *Bromus inermis*, *B. marginatus*, *B. catharticus*, and crested wheatgrass have been tried once only so far. Both *B. catharticus* and crested wheatgrass failed to establish satisfactorily, and no information is yet available on the performances of *B. inermis* and *B. marginatus*. *B. inermis* is highly valued in North America as a companion grass with lucerne and for its resistance to drought.

In two trials grazing lucerne (*Medicago glutinosa*) was compared with ordinary lucerne. It was slower to establish than ordinary lucerne and seemed unable to compete with the associated species.

Most trial work has been done on cocksfoot-lucerne mixtures. Both these species are slow to establish and permit the ingress of weeds. Once the cocksfoot is established, however, it is vigorous and can keep the pasture relatively clean, often at the expense of the lucerne. At high seeding rates cocksfoot tends to become dominant and provide too much competition. Care must be taken to get the optimum rate of sowing at which it will combine with lucerne and give a good mixture. Reports indicate that 2lb. per acre of cocksfoot to about 10lb. to 12lb. per acre of lucerne gives a good proportion, though good pastures have been obtained with only 1lb. of cocksfoot. Heavier rates of cocksfoot have given a better-balanced grazing mixture and the bulk of feed has been temporarily increased, but the lucerne under such conditions has decreased almost to vanishing point.

Reports on phalaris-lucerne mixtures are somewhat contradictory. Some observers place it above cocksfoot-lucerne and others consider that it is not as good. Phalaris does seem to thin out after about 2 years, and so far its over-all production is not equal to that of cocksfoot. A suggested reason given for its excellent growth and good appearance in one trial is that a lack of interest was shown in it by stock, which preferentially grazed cocksfoot-lucerne mixtures. However, the over-all picture indicates that phalaris-lucerne is reasonably satisfactory, but that cocksfoot-lucerne is better.

At the moment there are not many trials using either meadow fescue or timothy with lucerne. There are indications, however, that both could produce good pastures in association with lucerne, meadow fescue possibly being better than timothy, which in two trials has shown itself to be a little slow in recovering from grazing with a tendency to become spindly. Meadow fescue tends to be quicker to establish than cocksfoot and shows vigorous recovery growth after grazing. Though it prevents ingress of weeds, it does not appear to suppress the lucerne. One trial with plots of meadow fescue and timothy respectively sown in alternate rows with lucerne is developing a satisfactory sward and shows promise.

METHODS OF SOWING

Comparisons have been made of broadcasting, oversowing, drilling with 7in. and 3½in. coulters, cross-drilling, drilling lucerne and grass in alternate rows, and drilling them together. Seeding rates have also been compared. Broadcasting has given quicker establishment than drilling, but it is a method of sowing more applicable to quickly establishing species such as ryegrass. For the slower-establishing species drilling is better, especially on light land. It gives the seedlings more moisture and a chance to establish properly and combat weed invasion. Two to 3 years after trials which compared broadcasting with drilling were laid down there was little to choose between the results of the two methods. Results comparing drill widths, alternate rows, and cross-drilling are so far inconclusive.

INOCULATED SEED ESSENTIAL

Inoculation of lucerne seed is essential. Trials that did not use inoculated seed were a virtual failure, as was a trial which instead of using inoculated seed used soil from a good lucerne stand.

Good pastures have developed in most cases where lucerne has been sown in conjunction with a grass or with a mixture of grasses. There are some failures, especially on depleted tussock country, where the species failed to establish satisfactorily. One trial in the Mackenzie Country has given excellent results and a good productive sward has developed with lucerne playing an important part in herbage production.

A suggested improvement in grass-lucerne mixtures is the addition of clover. When the lucerne-grass stand is well developed there is often little bottom growth and it is hard to keep clean. Clovers provide a bottom growth and help stop weeds coming in.

Lucerne-grass (mainly cocksfoot) mixtures are proving very satisfactory under careful management and appear to fill a useful role on light and droughty land.

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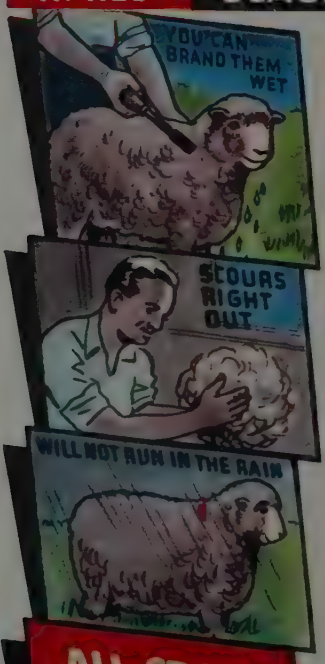

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Soil Blocks

By C. L. NAPIER,

Horticultural Instructor, Department of Agriculture, Palmerston North

SOIL blocks came into popular use in England about 7 or 8 years ago. Since then they have become increasingly popular in New Zealand, particularly with growers raising tomato plants. Results over the last few years have shown the blocks to be of value, and provided growers are prepared to enlarge propagating houses and extend propagation benches, there is no doubt they will become more widely used. This article reviews some early commercial findings in New Zealand with soil blocks and also suggests further possibilities for adoption in this country.

THOUGH soil blocks were not adopted in New Zealand for the same reason as in England—a shortage of clay pots—their acceptance can be regarded as evidence of a desire of horticulturists to improve their propagation techniques.

In New Zealand no controlled experiments have been carried out to compare soil blocks with more established methods of plant raising. However, growers' results leave no doubt that provided a few basic principles are followed, success is assured.

A single-mould soil block machine, showing one method of making the blocks on a concrete base.

[*R. W. Orr*

A uniform tray of tomato plants, showing one method of placing soil blocks in a tray.

Advantages

One of the chief advantages in the use of soil blocks is that a growing season can in effect be made earlier. Where cloches or frames are used it is possible to grow plants to a more forward state than in boxes and then plant them out under glass. Frost, of course, is the limiting factor in some districts, but even where frosts may occur it is possible to gain at least 1 month where cloches and blocks are used in conjunction.

Another important factor in the use of soil blocks is that plants do not receive a check when they are set out. This factor can reduce a growing season by up to 4 weeks. This takes into account not only the elimination of a check to plants when they are planted out, as with tomatoes, but also slightly earlier ripening of the fruit, again as with tomatoes.

An important point with the use of blocks is the smaller volume of soil required, which ensures more rapid warming up. This tends to speed germination if seeds are sown in the blocks, and growth of the plants is rapid.

When plants in boxes reach the normal transplanting stage they do not stand long before deteriorating, but it has been shown that plants in soil blocks will stand for a much longer period without any apparent deterioration in vigour or health. In addition, when they are planted out there is no suppression to growth through broken roots as would certainly occur with plants transplanted from boxes.

The fact that plants can be grown on for a longer period in blocks than in boxes is important for glasshouse tomato growers. A few such block plants carried over can be used as replacements if necessary, and this ensures that all plants in the subsequent crop will be of even size and maturity.

In all methods of propagation it is advisable to use sterilised soil if diseases are to be kept at a minimum. However, in boxes there are times when disease (for example, damping off) does break out even in sterilised soil. This can mean a big loss, as it is almost impossible to localise the disease in a box of seedlings. Soil blocks do not present the same problem, because if an outbreak does occur, affected blocks can be quickly destroyed.

Disadvantages

The adoption of blocks may necessitate more glasshouse space and greater bench area to accommodate the blocks and seedling trays. Blocks vary in size, but perhaps the most common is of 3in. diameter. Twenty of these will fit into a 19in. x 14in. seedling tray, which normally takes 54 pricked-out seedlings. It is common practice to space the blocks diagonally, similar to the way apples are packed. This gives a space between blocks which allows air circulation, thus increasing the chances of the blocks drying out. If the surface of a block does dry out, it becomes hard, is difficult to wet again, and acts like a clay pot in that the plant roots may become "pot bound".

It is not necessary to space the blocks in the early life of the plants provided growth is watched carefully. As soon as roots are noticed coming through the blocks the plants should be given more room by spacing them farther apart. If blocks are left close together and roots grow from one to the other, a check to the plants will

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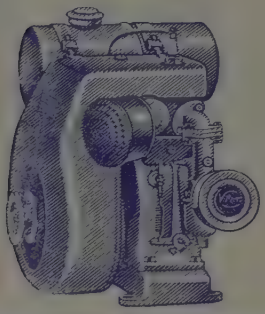

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result from the broken roots when the blocks are separated.

On a plant-for-plant basis more time is required to make blocks and plant them with seeds than is required to place seeds in a box. However, growers raising their own plants will not find the extra time any burden, but this could be a disadvantage to a nurseryman. Using a single-mould machine as shown in the lower illustration on page 401, growers new to soil blocks can comfortably make at least 500 blocks per day and sow seeds in them.

Soil Mixtures

Growers generally have experimented with various soil mixtures in an endeavour to find the right mixture for binding. Many failures have been caused not by the mixture but by the moisture content of the soil used. This is illustrated by trials with a few blocks each of eight different mixtures which were made on 15 November 1954. These were placed in a propagating house and watered regularly. A critical inspection was made on 2 December 1954 to ascertain the compaction of soil, the moisture content, and the amount of handling each type would stand before disintegrating.

The various mixtures and their characteristics are described here. The term "normal moisture" means the desirable moisture content of ordinary potting or pricking-out compost, and "extra moisture" means a slightly moister mixture which was considered necessary for soil block making.

1. John Innes potting compost (loam 7 parts, peat 3 parts, sand 2 parts) with normal moisture was a little crumbly and tended to fall apart when handled.

2. The same mixture as No. 1 with extra moisture held together very well without affecting aeration and development of plant roots.

3. Ordinary turf loam with normal moisture was satisfactory. This mixture contained more fibre than No. 1, which probably accounted for its better binding qualities.

[R. W. Orr

These marrow seedlings are from seeds which germinated in 2 days and were up in 4 days. They were sown on 16 August and photographed on 1 September. They were raised in an unheated, lean-to propagating house.

4. The same mixture as No. 3 with extra moisture was too hard; that is, it looked as though the block had been compacted too much. It had a brick-like outer surface which may have been troublesome if allowed to dry out.

5. A silt loam with fibre and normal moisture was slightly crumbly. However, with reasonable handling it would have held together.

6. The same as No. 5 without fibre. It was far too crumbly.

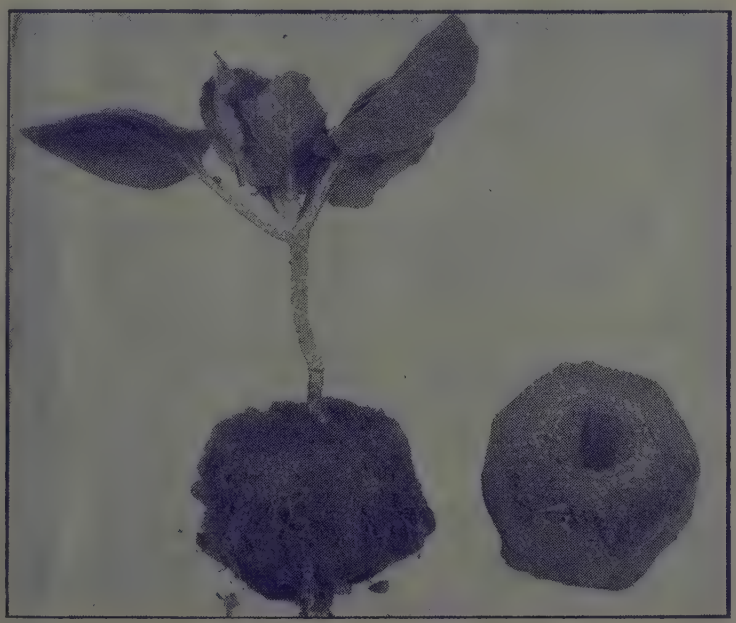
7. Silt loam with fibre and extra moisture appeared sticky before the blocks were made, but proved satisfactory.

8. Dry turf loam without any additional water was far too crumbly and was almost impossible to mould.

The fibre in the mixtures was the normal grass root fibre found in good turf loam. It was considered that all the blocks which held together satisfactorily, except those that were too compact, would have provided a good medium in which to raise plants. However, for satisfactory and balanced growth fertiliser would need to be added, particularly to the silt mixtures.

This small experiment bore out previous beliefs that though fibre is important, moisture appears to be just as important.

Growers in the Auckland district have had satisfactory results from the John Innes soil block mixture (loam 7 parts, peat 5 parts, sand 3 parts).



[R. W. Orr

This cabbage plant is one of a number raised in 3in. blocks and planted out 2 months after the seed was sown. It was lifted after being planted out.

Fertilisers

The amount of fertiliser to add to a soil block mixture depends to some extent on the type of loam used. For instance, the John Innes soil block mixture could have 2lb. of superphosphate and 1lb. of lime added to each cubic yard. The ordinary John Innes potting compost could have 2lb. of superphosphate, 2lb. of sulphate of ammonia, and 1lb. each of potash and lime added per cubic yard.

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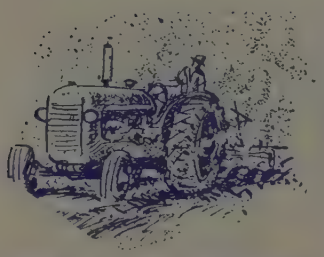

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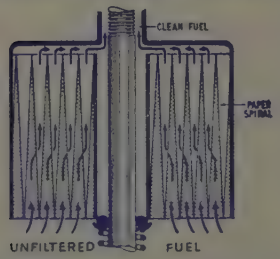

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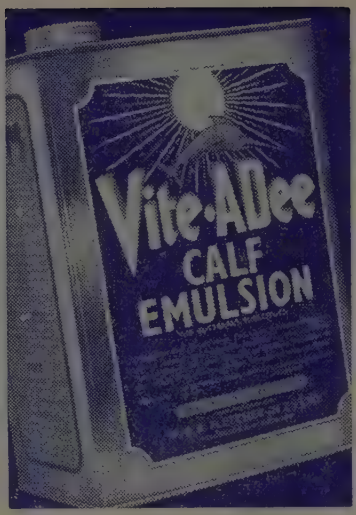

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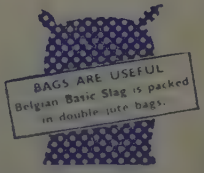

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Effect of Too Much Moisture

Though soil block mixtures should be a little moister than ordinary pricking-out soil, growers should take care not to add too much water. A sticky soil tends to pack hard, thus reducing pore space and air circulation.

Compaction

Fibre and moisture content are very important, but the compaction of the block is also important. It is difficult to suggest relative percentages of fibre and moisture for any soil type, as soils vary very much. However, growers about to adopt soil blocks would be wise to practise with various mixtures and compactions. Most moist soils, particularly if they are a little too moist, will compact very easily. The right pressure, especially when a hand machine is used, will come only with practice.

Methods of Making Blocks

Growers have various methods of making blocks. With hand machines the soil mixture can be spread on a concrete surface as shown in the lower illustration on page 401. The space by the low concrete wall in the background was used as a bin in which the soil was previously sterilised.

Another common method is to work up an area in open ground with a rotary hoe or similar machine. The grower then works his way over this area as he makes the blocks. The soil can be reworked at intervals as it becomes compacted.

Larger machines are at present being used only on a small scale, but there is no doubt they will become more widely used.

Very sturdy tomato seedlings ready for setting out. The unbroken roots are due to the blocks having spaces between them in the box.

The illustration on page 403 shows at right a completed soil block with the central hole made by the plunger of the machine. It is common to find the inside surface of this cavity very smooth and hard and this can prevent the roots of a seedling entering the body of the block. An ingenious but simple method to overcome this has been devised by a Hastings grower. At three points toward the end of the plunger and equally distributed around it small roughened pieces of metal have been welded. When the plunger is withdrawn it breaks the smooth surface of the cavity, thus allowing the roots to break into the surrounding soil.

[*R. W. Orr*

A vigorous tomato plant 12in. high held for over 2 months in the block.

Sowing or Pricking out

Soil blocks are equally suitable for sowing and pricking out. Both methods have been used with several vegetables by many growers. With seed such as those of cucumbers and marrows it is no doubt best to sow the seed in the blocks. Alternatively, seeds can be germinated and then sown. This method ensures a more even strike and may eliminate a possible second sowing. Blocks will also eliminate the check that cucurbits usually get when they are transplanted from boxes.

Tomatoes can either be sown in the blocks or pricked out as soon as they are large enough to handle. The advantage in pricking out is that a more even line of plants may result, as seedlings can be graded. Raising cucurbits in soil blocks gives a very uniform planting, particularly where the seeds are germinated first. The cavities in soil blocks are too deep for seeds such as tomato seeds to be placed on the bottom. Before small seeds are sown a little fine compost should be dropped into the bottom of the cavity first. The seed can then be lightly covered with fine compost and the whole block watered through a fine rose. Similar fine compost should be used for pricking out.

Plants can be raised under cloches if glasshouses are unavailable. One grower at least has constructed his own tray for holding soil blocks. The outside measurement of this tray is 22½in. x 18½in. x 3¼in. At one end a 6¼in. movable piece allows the blocks to be slid out. This is necessary, as the tray is higher than the blocks. One of these trays fits comfortably beneath an ordinary barn cloche. The one disadvantage of this size of tray is its weight when it is full of blocks.

Watering

Blocks should be watered regularly through a fine rose. This reduces the risk of the blocks drying out. A fine spray is best, as a coarse one can break up poorly bound blocks. It is important to keep wet the complete surfaces of soil blocks and not just the tops.

Planting out

Soil blocks can be set out at any time suitable to the grower. If conditions are unfavourable for planting, blocks can be held much longer than boxed plants before they are set out. This applies particularly to tomatoes. The illustration at left shows a tomato plant which was pricked out on 13 May 1954. The plant was photographed on 16 July, when it was 12in. high and in excellent condition.

An important factor when soil blocks are being set out is that the

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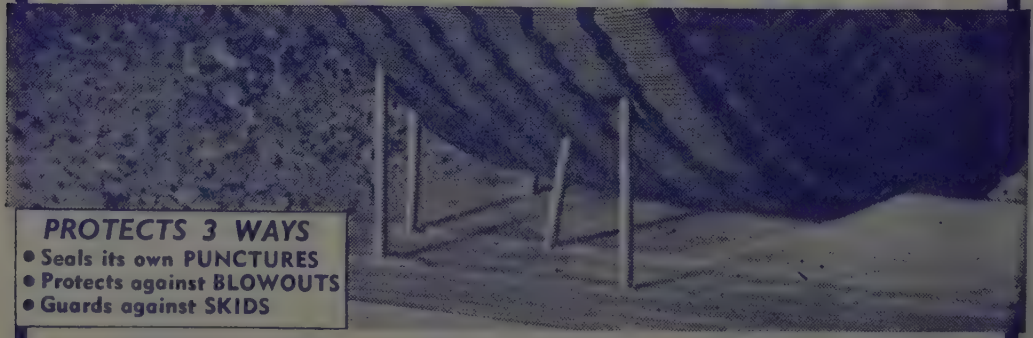

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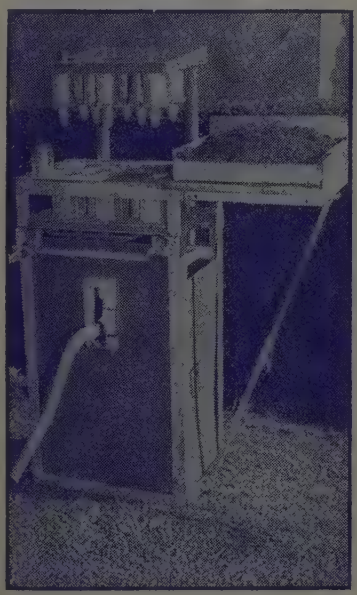
PLANTS IN SOIL BLOCKS COMPARED WITH PLANTS FROM BOXES

[*R. W. Orr*

The plants in the two rows in the left foreground are from boxes and those beyond are in blocks. All were planted on the same day. Results have shown that plants from blocks crop about 10 days earlier than those from boxes.



This large machine can make eight soil blocks at a time.

soil being planted up must not be drier than the soil blocks. If it is, the roots may not leave the blocks. The dry soil can also dry out the outer surfaces of the blocks. Planting is easily done with a trowel, but there is available a dibble made specially for setting out blocks. The dibble is suitable for 3in. blocks and has the shape of a small post-hole digger.

Comparisons by Growers

Some growers have themselves compared plants in soil blocks with those from boxes. One such comparison is shown in the illustration above. Plants from both boxes and blocks were set out on 15 June and were photographed on 15 July. When they were photographed the plants from boxes had the first truss in bud. Those raised in blocks had the first truss flowering and were four nodes above the truss. Comparisons for several years have shown plants from blocks cropping about 10 days earlier than those from boxes.

Future of Blocks

With larger block-making machines becoming available the time required to make blocks is being very much reduced. Provided space can be allotted, there is no reason why soil blocks should not be used for a wide range of plants. Plants suitable for this method of raising are tomatoes, early marrows, pumpkins, cucumbers, water and rock melons, cabbages, cauliflowers, celery, lettuce, chrysanthemums, dahlias, and bedding plants such as stocks.

Ease in handling is a big factor and the size of the block has a large bearing on this. The larger the block is, the more food value there is and the stronger the plant should be. Also, all plants have the same amount of food. However, for better handling a medium-sized block (3in. to 3½in.) would be suitable without being too bulky.

If all aspects of the using of blocks are considered, it will be seen that advantages such as no check in growth, a shorter season, and earlier cropping make the blocks very suitable for plant propagation.

Messrs. Martell and Wood, Bay View, and Dowdall, Cockburn, and Butcher, Hastings, are thanked for information used in this article.

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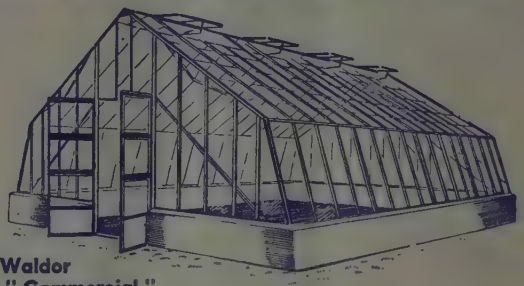

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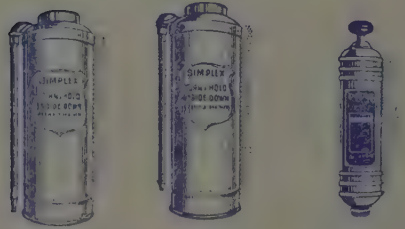

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Introducing a New Queen to a Colony

Seasonal Notes for the Domestic Beekeeper

WITH the progress of spring and the advent of early honey flows beekeepers will be able to judge the quality and condition of the queens in their colonies. The prime factor in the success or failure of the bee colony is the condition of the queen. Vigorous, healthy queens of good strain and egg-laying ability are a necessity if maximum honey crops are to be secured. In this article D. Roberts, Apiary Instructor, Department of Agriculture, Auckland, discusses points indicating good queens and describes methods which assist in the safe introduction of replacements.

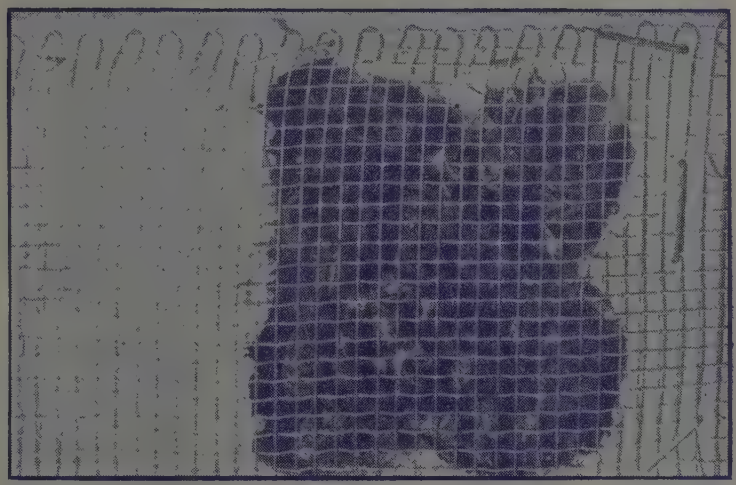
THE presence of a large number of worker bees of proper age throughout the honey flow is essential if the colony is to secure the greatest possible crop of honey. Because the queen is the mother of the colony and is solely responsible for the laying of the eggs from which this force of bees is raised, her physical characteristics, breeding, and health are of the utmost importance to successful honey production.

Judging the Queen

In late winter and early spring when brood rearing has either ceased or is greatly restricted it is difficult to assess the worth of a queen other than by her physical appearance. If brood rearing has ceased, the queen's abdomen may have shrunk considerably and her appearance at this stage may be misleading.

Unless failure of the queen is obvious because of the presence of drone brood in worker cells or a complete absence of eggs in conditions which favour some brood rearing, the judging of the queen should be deferred until weather and food sources are such that brood rearing is fairly well advanced. If, in these conditions, laying is still restricted, with the eggs laid unevenly in the cells and with brood hatching unevenly, the queen should be replaced. Estimates of the queen's condition can be safely made when brood rearing has been extended to three or four frames. If the combs are well occupied with concentric circles of brood of similar age, the queen shows evidence of good physical condition, and the bees are of even colour and marking, the queen can be considered satisfactory.

When a queen is being judged by appearance the following points should be observed. The abdomen should be particularly large and full along the sides and should have a gentle taper. Colour should be even, and movement over the comb should be steady. The wings should not be frayed or the down on the body worn or shiny.



Sparrow

A queen-introducing cage containing a queen and escort bees.

Though a queen may be of good size and may be laying evenly, frayed wings and a worn appearance indicate that she is becoming aged and will possibly soon fail. It is good policy to replace such queens at the first opportunity. A queen that has a short or stubby body or whose abdomen tapers sharply, finishing with a point, is not likely to be successful. If the movement of the queen over the combs is erratic or wobbly or her colouring is markedly uneven, she is not likely to be worth keeping.

Unless a queen conforms fairly closely to the following points, the colony which she heads is not likely to reach a high standard of production:—

1. A large and gently tapered abdomen.
2. Even colour.
3. A large thorax.
4. Steady, even movement on the combs.
5. Good, even laying of worker brood.
6. Eggs laid in the centre of the cell bottom.
7. Eggs laid symmetrically, spreading evenly from the centre of the combs in all directions.
8. Progeny evenly marked and gentle to handle.
9. No worn wings or shiny or greasy-looking body parts.

Though recognition of points 1 to 4 and 9 is not difficult when the queen is of a gentle strain and is easy to locate, difficulty may be experienced if the colony is nervous. With most black and many hybrid strains the irritable and nervous traits inherent in the bees make the locating of the queen a most difficult and trying procedure unless special methods are adopted.

In New Zealand the Italian or, as it is sometimes called, Ligurian strain of honey bee has been found to be the most satisfactory for commercial honey production. Good Italian strains are generally better honey gatherers, are less inclined to swarming, and are gentler to handle than either black or hybrid strains. An additional advantage of the Italian strain is the outstanding difference in colouring and shape of the queen. These factors, together with the generally better handling qualities of the Italian, make checking of the queens of good Italian strains comparatively simple.

Beekeepers keeping only a few hives as a hobby or for honey for domestic consumption will find that the introduction of a good strain of Italian bee will greatly increase the pleasure and ease of working their colonies and will generally make for better honey crops.

Finding the Queen

Queens are much easier to find in the early part of the season before the population of the colony becomes too large and when brood is confined to only a few frames. When the queen is being looked for the colony should be disturbed as little as possible. The hive should be opened quietly and only sufficient smoke used to keep the bees under control. Movements should be easy and gentle, and removal of frames should be done so that there is no jarring or crushing

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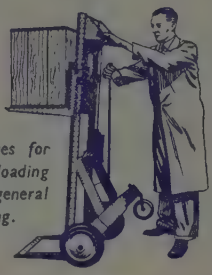

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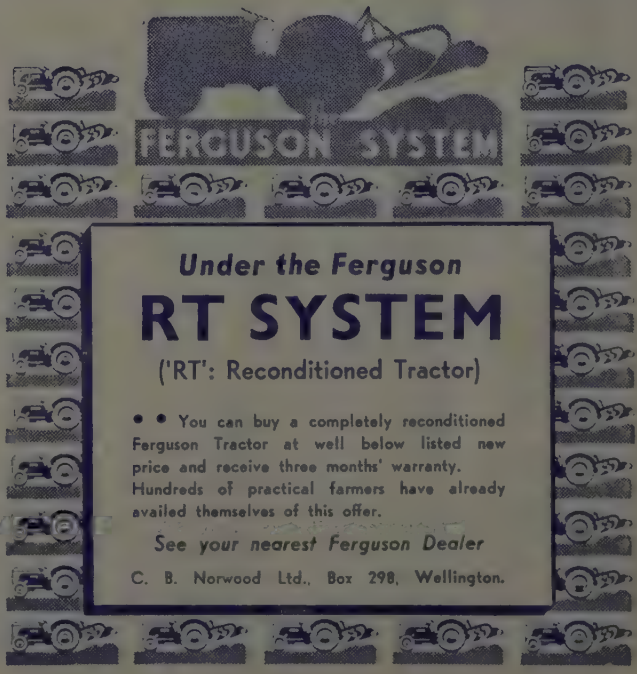

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of bees. The queen will seldom be found on combs which contain no brood or eggs unless the colony has been unduly disturbed through jarring or the use of too much smoke. One or two combs from the side of the brood chamber should be removed first, checked over, and stood on end at the side of the super next to the entrance. The remaining combs should be lifted out one at a time and thoroughly scrutinised. After each comb has been examined it should be placed back in the super against the side from which the first combs were removed. It is a good plan to look quickly for the queen on the exposed side of the next comb in view before examining the one just removed.

When there is a honey flow in progress there will be little chance of robbing commencing, and at such times combs can be placed outside the hive in proper order as they are examined. They should always be returned to the hive in their original order. If the queen is not found on the first examination, the combs containing brood and eggs can be returned to the hive in pairs, each pair separated from the others by 1in. The hive is closed for about 15 minutes and then a further examination is made, each pair of combs being examined in succession, the queen being looked for first between each pair.

If the colony to be requeened consists of two or more hive bodies, it is a good plan to place a queen excluder between each body, the top ones being examined first. The excluder will prevent the queen from moving from one body to another during the examination. If excluders are not available, the hive bodies can be stood apart. They should be quickly covered with spare lids or a clean sack, and each can then be examined separately.

When these methods fail the bees can be sieved through a queen excluder. If it is properly carried out, this method will prove entirely successful, but it involves considerable disturbance to the colony. If a colony has been examined and the queen has not been found, it should be closed up and left to settle down for a few hours before sieving is undertaken.

Where a colony is to be sieved the hive bodies should be moved to one side with as little disturbance as possible, each one being covered separately. Place a super of empty combs on the bottom board, on this place a queen excluder, and on top of this place an empty super. Shake or brush the bees into the empty super, taking care not to drop them outside. A few gentle puffs of smoke will then drive the bees down through the excluder, leaving the queen on top. The excluder used should be in good order; if it is strained or damaged, the queen may be able to pass through the slots. When the bees are being brushed into

[*Rendell's*

Placing a queen excluder in position for sieving bees. If sieving is carried out properly, it will be entirely successful, but it involves considerable disturbance to the colony.

[*Rendell's*

Driving bees through the excluder. The excluder used should be in good order, because if it is strained or damaged, the queen may be able to pass through the slots.

A young queen (left) and an old, failing queen (right). Note the ragged wings and shiny body of the old queen.

the super they may show an inclination to boil up and escape over the sides. A few light puffs of smoke will overcome this, but just sufficient smoke to control the bees should be used, as too much will only aggravate the position.

Introduction of the Queen

Though there are many methods of introducing queens to a bee colony, there is one cardinal requirement which must be observed before any introduction is attempted. It is, of course, the removal of the old queen. This is essential if acceptance of the new queen is to be secured. The colony should also be checked for the presence of queen cells. If any are found, they must also be removed. If queen cells are found in any number, the new queen should not be introduced immediately, but should be held over in a nucleus hive for a week, when a further check should be made and any further cells cut out before introduction is attempted.

During spring requeening the bees may have superseded the old queen, who may still be present in the hive with her daughter. If during the check for queen cells only one or two are found with evidence that the queens have recently emerged, a very close check of the colony must be made and the newly hatched queens located and removed. In normal circumstances bees will not tolerate more than one queen in a hive, but when supersedure has occurred it is not unusual for the newly raised queen to be found sharing her duties amicably with her mother. Such conditions do not prevail for more than 2 or 3 weeks, but if introduction of a new queen in this period is attempted without removal of both mother and daughter, failure will only result.

In spring introduction of new queens much better acceptance will be achieved if the introduction is made when nectar is being freely gathered. Should there be no nectar flow when requeening is to be done, feeding of a honey or sugar syrup for a day or so before introduction of the new queen will help toward acceptance.

Introducing Cages

Beekeepers buying queens from commercial breeders will find that the queens are dispatched to them enclosed in introducing cages. The introducing cage as used for dispatch of queen bees is a block of wood up to 4in. x 2in. x ¾in. hollowed out on one side with the space covered with fine wire gauze. Each end of the block has a ¾in. hole drilled in it through which the queen and attendant bees are placed in the cage. One hole is then covered with wire gauze and the other is filled with a candy made of honey and icing sugar. When the cage is dispatched the outer entrance of the candy-filled hole is covered with a strip of cardboard. Sufficient candy to ensure that the queen and her escort bees suffer no lack of food for some days is placed in the cage.

If queens dispatched in this manner arrive when weather or other considerations make it inadvisable to place them in the hives immediately, they can be safely kept for a day or two provided they are in a warm, dry place. The cupboard containing the hot water cylinder will usually be excellent for this purpose. It is better to hold queens in this way than to attempt to introduce them in unfavourable conditions.

The actual introduction of the new queen with the aid of the introducing cage is very simple and almost entirely automatic.

After the old queen has been removed from the colony to be requeened and the beekeeper is certain there are no queen cells present the cage containing the new queen is laid gauze side down over the frames of the brood chamber. The frames should be slightly spaced so that the bees of the colony can see and feed the queen through the gauze. The bees usually gnaw away the cardboard covering the candy-filled hole in a day or two and then will eat out the candy in the hole in 12 to 24 hours; thus 3 days may have passed before the queen is released.

In these 3 days the bees of the colony have become thoroughly acquainted with the new queen and on her release acceptance will normally be assured.

Most commercial suppliers of queens attach full instructions for introduction to each cage. If these are strictly adhered to, no difficulty should be experienced.

After a new queen has been introduced the colony should not be disturbed in any way for at least a week. If the hive is opened within this period, the bees may either kill the queen or damage her irreparably. When the hive is inspected in a week to see if the queen has been duly accepted it is not always necessary to find her. If eggs can be seen in the cells, they will be sufficient indication of her presence.

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Intending applicants are hereby notified that applications for registration under the Dairy Factory Managers Regulations should reach the Registrar, Dairy Factory Managers Registration Board, c/o Department of Agriculture, P.O. Box 2298, Wellington, on or before 1 December 1955. Forms are available from the Registrar.

Attention is drawn to the fact that under the Regulations any application which is received by the Board after 1 December 1955 shall not, except in special circumstances, be considered by the Board until after 1 December 1956.

N. E. SYMONDS,
Registrar.

N.B.—*This notice refers to persons who are NOT AT PRESENT HOLDERS OF CERTIFICATES. Notice of renewal and renewal form will be posted to every registered manager by the Registrar.*

Pullet Requirements of the Household Poultry Keeper

EACH year under ordinary circumstances householders owning poultry wish to replace some or all of their laying birds. Others are perhaps starting new household poultry units and are wondering what breed to keep and where to buy pullets. This article by the Animal Industry Division discusses various aspects of the buying of pullets for next year.

THE time has arrived for poultry keepers to make certain they can obtain any pullets required for next laying season. Some will already have taken this step, but all too often householders leave this job until too late in the year and then wonder why they have difficulty in getting their requirements. Furthermore, if orders are placed too late, there is a chance of getting poorer-grade pullets, namely, late hatched birds and those left after other orders have been supplied.

What Birds should be Replaced

Pullets, whether perching pullets 10 to 12 weeks old or ready-to-lay birds, appear costly to most householders. The tendency is, therefore, to consider keeping this year's birds for another season, especially if they have been healthy and have laid well. This is a policy worth considering, but two aspects of this question should be carefully thought over.

If some of the birds are completing their second year of laying, that is, they are hens, without question they should be disposed of and be replaced with new pullets. If the birds are last year's pullets (hatched in 1954), these will be completing their first laying year in February or March 1956 and will be going into a full annual moult at that time. The important point is that these birds, owing to the moult, will be out of production until mid-June or July of next year. In other words they will supply the householder with few or no eggs during the period when egg prices are at a peak and when supplies are limited. Furthermore, during the 12 to 14 weeks that these birds are out of lay they have still to be fed and thus cost money. New pullets, on the other hand, coming into lay in February or March supply eggs just as the older birds are finishing laying and moreover should continue to lay throughout the winter.

There is one practical difficulty: Young, new-season pullets must not be mixed with the older birds. Consequently some temporary arrangement is necessary to provide for two pens to separate them until the older birds are eaten or sold. One final point which can also be considered is that losses among pullets in their first year of laying are likely to be heavier than among hens. Losses among pullets in a household flock of a few birds are to some extent a matter of chance. Under commercial conditions the average loss among pullets is probably around 15 per cent. each year. In household flocks this means on an average 1 bird in 6.

[*Niederer*

An Australorp cross White Leghorn pullet, an excellent type of layer for the household poultry keeper.

Reminders for October

NOW is the time to preserve eggs for use next winter. Eggs used for preserving should be clean and not cleaned and also should be infertile. To ensure infertile eggs there should be no male birds running in the same pen as the laying birds. Cleaned and fertile eggs when preserved may break down or deteriorate before they are required.

Heavy-breed birds in particular may show signs of broodiness at this time of the year. When broody they should be removed from the nest and placed in a broody coop for 3 or 4 days and then returned to the pen. While in the broody coop the birds should receive food and water in similar quantities to those given to other birds. A shortage of food and water may delay production after they have ceased to be broody.

All laying birds should now be in full production. Such birds should be active and alert. A good layer has a bright comb and face. The abdomen is soft and silky, the vent moist, and the pelvic bones and keel or breast bone wide apart. Any bird which is dry in the comb and face, has a small, puckered vent, and pelvic and keel bones close together should be culled from the flock and used for the table.

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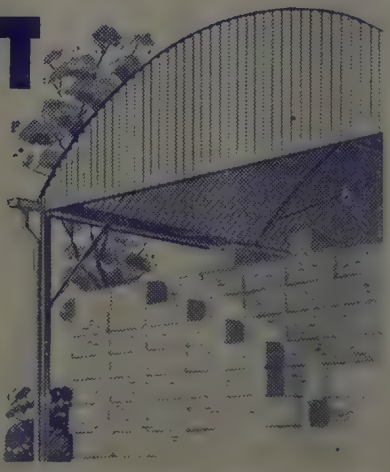

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White Leghorns mated to Australorps give crossbred pullets which are popular for commercial egg production and excellent producers for the household poultry keeper.

Choice of Breed

When choice of breed is being made it should first be remembered that only a limited number of breeds have been developed in New Zealand for commercial egg production. The main breeds kept are White Leghorns, Australorps (Black Orpingtons), and Rhode Island Reds. There are also a limited number of good Barred Rocks. There is no best breed for egg production. Much depends on how any of the breeds named have been bred for egg production.

In the past few years in particular there has been a marked increase in the sale of first-cross pullets, obtained largely by mating Australorp males to White Leghorn females or the reverse. These are proving to be very popular for egg production, particularly as they are good winter producers. In general they lay more winter eggs than the White Leghorn, but, unlike the latter, crossbreds do go broody in spring and summer. Crossbreds can, however, be recommended for household flocks. Australorps, too, are good layers, including of winter eggs, but will go broody in warmer weather. Rhode Island Reds sometimes disappoint householders, as they may take longer to come into lay than any of the other breeds or crossbreds mentioned.

An excellent example of a Rhode Island Red cockerel. It is not often that a household poultry keeper owns a cockerel of this quality, and this is why he is recommended to buy from a breeder, who has an opportunity to select high-quality birds.

Where to Get Pullets

Householders who have no knowledge of the poultry industry or no poultry farmer friends may wonder how best to obtain young pullets of satisfactory quality. Some will scan advertisements in the Press, some visit auction markets, and others approach the Department of Agriculture for the names and addresses of poultry breeders in their districts.

In general it is not recommended that birds be purchased at public auction. The birds sent to auctions are mainly culls from commercial farms; though they are often good table birds, they are rarely good pullets for future egg production.

Poultry Flock Improvement Plan

When poultry keepers ask Departmental officers for advice about buying poultry it is practice to supply the names and addresses of several poultry breeders for a district and to leave the householder to make a choice. It is also common practice for the Department to supply the annual list of accredited breeders under the New Zealand Poultry Flock Improvement Plan, a scheme for commercial poultry breeders which was started in 1945. Under the conditions governing this plan certain important steps are taken to assist breeders to maintain healthy and good-quality breeding birds. These may be summarised briefly as follows:—

All birds used by an accredited breeder during the breeding season have previously been handled by an officer of the Department, who has to be satisfied that they are healthy and have a good constitution. The birds must also be of a reasonable weight (minimum weights are prescribed) and reasonably typical of their breed. Once the birds are passed for breeding sealed leg bands are put on their legs. For all purebred matings **hens only** are permitted. For crossbred matings well-developed, mature pullets are accepted. Before a poultry breeder is accredited the accrediting officer must be satisfied about the general conditions on the farm and the ability of the owner as a poultry man. In certain districts, notably Canterbury, poultry farmers who raise pullets mainly for sale to householders may also be approved under this plan. All these pullets are purchased by the pullet rearer as day-old chicks, **which must come from an accredited breeder.**

The information given shows that this plan is designed to assist poultry breeders at least to maintain breeding stock of a reasonable standard. Many breeders who have been accredited for a number of years have improved their stock. In ensuring good breeding stock the plan is also safeguarding as far as possible the buying public. Each year a list of breeders who have been accredited is published and copies are available from any Poultry Instructor or from the Department of Agriculture, Box 2298, Wellington. By obtaining a copy of this list the household poultry keeper has one way of ascertaining the names and addresses of poultry breeders from whom to purchase pullets.

Paths, Steps,

PATHS are one feature common to all gardens whether large or small and can make or mar the general effect. Their position, the materials used, and the details of construction all have a great influence on the appearance of the garden as well as promoting ease of access to the more interesting and important points. This aspect of garden planning is discussed by J. S. Say, Horticulturist, Department of Agriculture, Auckland. The notes on garden work for November are by K. H. Marcussen, Horticulturist, Department of Agriculture, Christchurch.

AS one of the main factors in laying out a garden is convenience, the positions of the paths are of great importance. They should be placed to give reasonably direct access from the doors to the street and to various points in the garden such as the garage and clothes line. Main paths such as these, which have to be used frequently regardless of weather, should be so constructed that they can be used comfortably at all times. Paths from house to street should always be wide enough to take two people walking abreast and care should be taken to give all plants, especially trees and shrubs, sufficient room to develop fully without encroaching on the pathways and consequently being spoilt by severe pruning.

The problem with the paths in a new garden is to combine utility and appearance, and with forethought this can be done. Though main paths should be as direct as possible, they need be neither straight nor unnecessarily numerous. Gentle curves can add interest and do not greatly affect direct access, but sharp curves and angles on a level section have a distracting effect and are open invitations to people to take short-cuts across the lawn or even through flower borders.

On sloping and hillside sections the problem becomes more difficult. Where the grade of a more or less direct path would become more than 1 in 6 it is advisable to take the path round in a wide sweeping curve or, on steeper slopes, it can be zig-zagged. Where possible it is better to avoid steps on the main path from the street to the house, especially where there are young children or elderly folk, but unfortunately there are positions where steps cannot be avoided.

← Upper—The gently curving path and plants make an attractive approach, and the grass strip and trailing plants on the retaining wall lessen the severity of the straight drive. Middle—Brick edges to gravel or sealed drives are neat and easily maintained. Lower—A corner of an informal garden with a path of square paving slabs. Small slabs are also used as stepping stones in the flower border. Sparrow photos.

and Drives

The way in which fatigue can be reduced is not always considered sufficiently when planning access to houses built on steeply sloping sections. Though the same amount of energy is used in reaching any given height whether by steps, a steep path, or a gentle slope, it is expended over a greater period of time on a gentle slope and therefore fatigue is not so great. It can be reduced still further by use of platforms or sections of level path at intervals instead of one continuous flight of steps or steep path. Fatigue is reduced for older people and the time factor is not usually greatly increased for young people who are physically able to move more quickly.

Most people have had experience of steps which are difficult or uncomfortable to use. The risers are either too shallow or too deep, or the treads are not wide enough to take the length of the foot or are too wide for a single pace but not wide enough for two. For example, steps with 13in. treads and 6in. or 7in. risers are comfortable, but with 4in. risers are not. On the other hand 4in. risers with 17in. treads are comfortable, but with 6in. or 7in. risers they become awkward to use. In general 6in. or 7in. risers with 13in. treads or 5in. or 6in. risers with 15in. treads are the most suitable proportions for normal use.

Where steps are used more as an ornamental feature in the garden and not on the main access paths, low risers and wide treads can be used. Though they generally look attractive and inviting, they are not so easy to use, but in this case utility can give way to appearance.

To prevent water from higher up on sloping sections using steps and paths as a channel it is sometimes necessary to intercept it with a drain at the top. Steps should always be given just sufficient slope forward to shed water, but a pronounced slope is dangerous. On the main access ways hand rails are advisable on flights of steps and steep paths.

Drives from the garage to the street should be no wider than necessary, but care should be taken to avoid the common mistake of making them too narrow. Unless there are sharp curves or raised edges, 7ft. to 9ft. is usually sufficient. For ease in backing drives should be straight or only gently curv-

Upper—The brick tiles of path and steps are in keeping with the brick base of the house. Middle—An unusual path on a steep, rocky section. The irregular pieces of coloured marble are set about ¼in. above the concrete to prevent slipping. Lower—Natural stone used for the edges, steps, wall, and chimney is a striking feature of this home. The gravel of the sealed turn-about harmonises with the general colour scheme. Sparrow photos.

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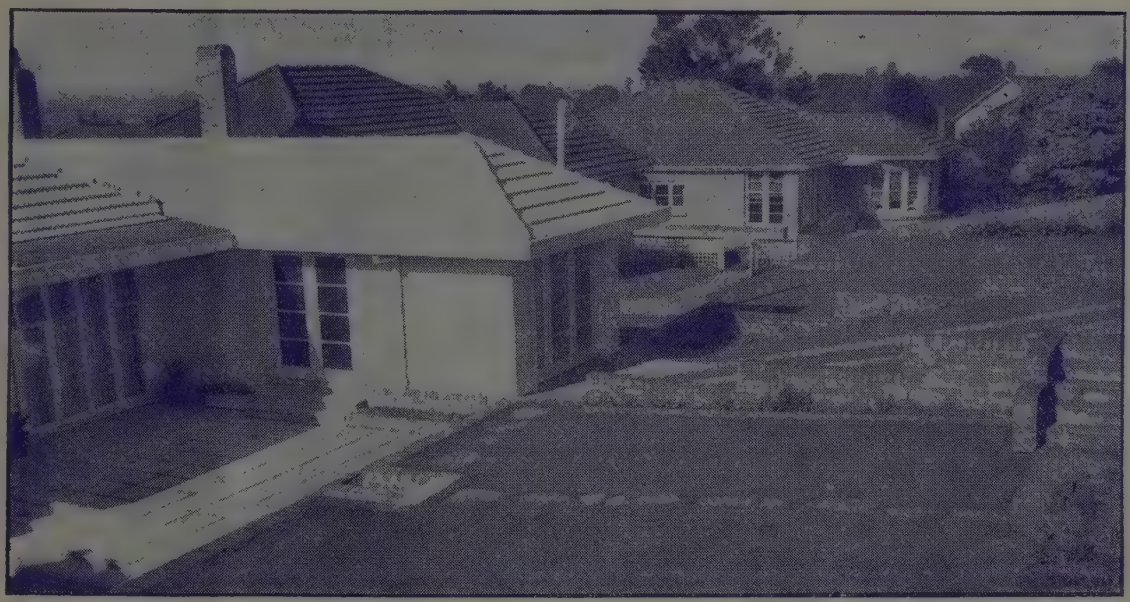

[*Sparrow*

Stepping stones used to form a serviceable yet inconspicuous path between house and garage.

ing and enter the street at right angles.

Sufficient thought is rarely given to the measurements when drives are laid down with two concrete strips. Frequently strips are only 18in. wide with 2ft. 6in. between. With the average medium-sized car with wheels 4ft. 6in. apart centre to centre, a drive with these measurements allows only 6in. to spare and even an expert driver may have difficulty in keeping on the concrete; on curves it is almost impossible to do so. The most satisfactory measurements are 2ft. 6in. strips with 2ft. between, giving a total width of 7ft. Cars of all sizes and trucks will be able to negotiate it with ease, except on very sharp curves.

When a curving drive is being laid down it is advisable to run the car into the garage and back it out again over the previously raked surface. The wheel marks will show the course most suitable for driving and where extra width is required for the front wheels to swing out when reversing round curves.

A point that needs to be watched in the construction of a drive below the level of the surrounding garden or close to buildings is that sufficient room is left to permit the doors of the car to open fully. An extra width of concrete is also useful at the usual point of loading so that it is not necessary to walk on a wet lawn.

Where space permits or where the garage is situated in an awkward position a turn-about is very convenient, but care should be taken to avoid a large paved area in front of the house, for it can dominate a small garden. This is especially so where concrete is used. Where a turning area can be built at the back of the house it can serve as a play area for children during winter, and for washing the car without detracting from the appearance of the ornamental section of the garden.

On a small section round-abouts take up too much room and make it almost impossible to plan an attractive garden, but on a section with a long frontage or on corner sections it is sometimes possible to have a through drive (that is, with a separate entrance and exit), an arrangement which is very useful to those who need to bring the car right up to the door.

Dwarf plants can be grown between slabs of a path or terrace in an informal garden.

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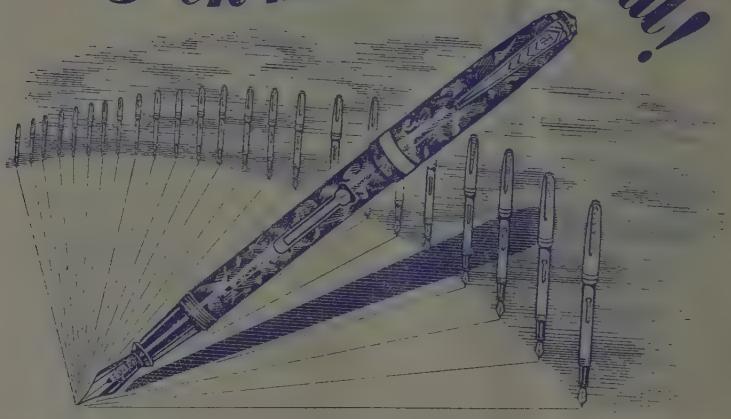

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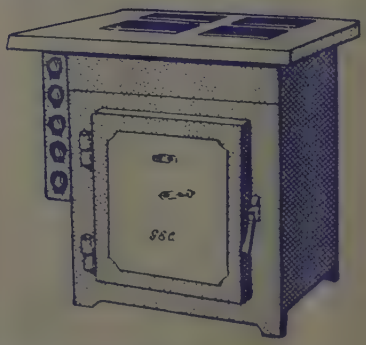

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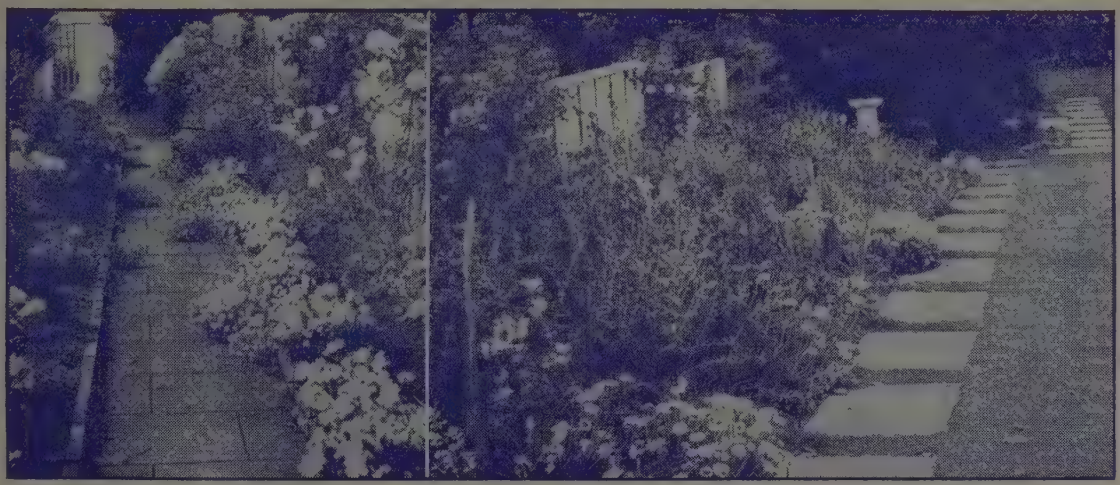


Left—A path of concrete slabs with a raised edge in a well-planted garden. Right—Concrete slabs make an excellent secondary path in the flower garden.

Materials

Whenever possible the materials should be in harmony with the house and surroundings so that the paths and drives become an integral part of the design, serving their purpose efficiently yet not appearing as something alien in the garden. They should be constructed in a way and of a material that will bear the weight of traffic using them and will drain quickly in heavy rain.

Many materials are suitable, but nowadays concrete is used almost exclusively. The initial cost is high, but upkeep is cut to a minimum and there is no doubt that concrete is the most serviceable though not the most attractive. The white line or lines of concrete paths and drives across a garden have the effect of dividing it into sections, making an attractive layout more difficult. This can be avoided to some extent by laying the concrete flush with the level of the lawn and by using two narrow strips for the drive. Where the drive is in a conspicuous position this looks much better than a solid mass and adds very little to the time and care spent in maintenance. The surfaces of paths which may become slippery can be roughened by drawing a stiff yard broom across the concrete just before it sets.

Neat and durable paths and drives, which do not need much maintenance if they are laid correctly, can be made from precast concrete slabs and blocks. They are available, or can be made by the handyman, in many shapes and sizes and can be laid in a number of ways, forming attractive patterns. In some positions such as an informal path or terrace in the flower garden spaces can be left between the slabs to allow low-growing flowering plants to grow. Paving slabs should always be set firmly to prevent any movement. Mortar can be used, but for a path it is usually sufficient to set them on a 2in. bed of sand. If drainage is poor, it is advisable to have about 4in. of metal below the sand.

Crazy paving formed of natural flat stones of various shapes and sizes is rarely seen in New Zealand, but flags made of concrete are sometimes used. A crazy paving effect can also be obtained by laying a solid path of concrete and cutting out deep grooves with a trowel as it begins to set. In general, crazy paving should be used with care. It is most effective in the informal garden, where plants can be allowed to grow in the cracks and encroach on to the sides from adjoining beds.

Stepping stones laid flush with the lawn are again becoming popular and are ideal in the flower garden where they do not have to carry heavy or concentrated traffic. They do not divide the garden up as do solid paths, yet provide a dry footway when the grass is wet. Rectangular slabs can be used or if something informal is wanted, irregular pieces can easily be moulded. Two or three moulds are sufficient, for if the pieces are set at various angles to the line of the path, the effect is a wider variety of shapes. In the setting out of irregular pieces the edges should not be in line, but the stones should be balanced on a central axis. The easiest way to set out a stepping-stone path is to lay the stones on the grass and move them about until they look right; then allow them to remain a few days, by which time the grass will be yellow. It is then a simple matter to cut out the correct shape and set in the stones. Their spacing is sometimes a little difficult, for the average man's pace is longer than a woman's. A good average is 20in. from centre to centre.

A stepping-stone path is an advantage in a flower or shrub border that is too wide to reach easily from the sides. It is inconspicuous yet will provide a clean, dry footway which is very useful when the usual maintenance work is being done.

Coloured cement is available for those wishing to put down coloured concrete paths or to make their own paving slabs, but to avoid a rather garish effect care should be taken to select colours that are not too bright and will match the colour (and possible future colours) of the house.

Tar or a bitumin preparation will give serviceable paths and drives that do not strike a discordant note with the garden or house. They can be surfaced with metal chips, which are available in various colours, or left with the natural dull black surface.

Maintenance is the main drawback, with tar paths, but if they have been well laid with adequate foundations, they will last many years before resurfacing is necessary. Strongly growing perennial weeds and grasses sometimes cause trouble, especially on the edges, where they work in from adjoining lawns or beds. A brick or concrete edge to the path will prevent it from crumbling and so help to check any weed invasion. Weeds should never be dug or pulled from this type of path, as this tends to break up the surface. Weedkillers are far more satisfactory.

A brick house with brick paths makes a very harmonious combination

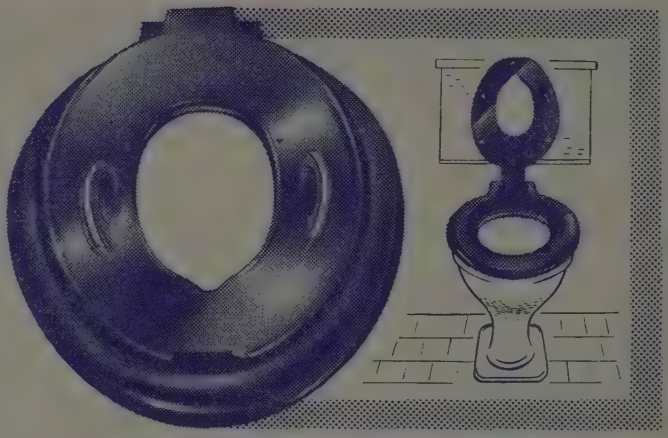
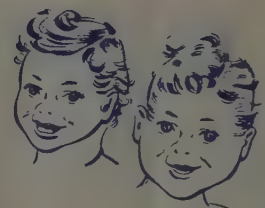


Illustration above shows the hinged supplementary seat lowered in position for children . . . note the correct size for tiny tots and the safety hand grips—if required, scarf or strap can be slipped through handles and around child for added security.



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which is not often seen today. Well-laid brick paths will last a lifetime and do not need a great deal of maintenance. They have the disadvantage of becoming moss covered and slippery in some situations, but they are worth considering in open, sunny positions or for informal paths in the flower garden where they are used mainly in summer. Firm foundations are essential. The bricks can be set in cement or on well-rolled and compacted cinders, gravel, or sand. If the cracks between the bricks are filled with sand and not mortar and the path given a slight camber, water drains away very quickly. A variety of simple but attractive patterns can be formed when laying them. When bricks are used for steps they should always be set in mortar, as loose bricks can be dangerous.

In parts of the flower garden and sometimes in the vegetable garden where there is little traffic and then usually only in fine weather a grass path has its uses. A path of this nature between two shrub or flower borders looks extremely well and pays for the extra time and trouble spent in maintenance.

Gravel paths and drives are cheap and easy to install and have a good appearance. The colour depends on the effect desired and the stone available in the district. If the edges are defined with brick or some other permanent material, they are not difficult to keep tidy and weeds can be checked by weedkillers. The chief drawback is that the gravel tends to be tramped into the house and on to the lawn. On heavy soils and where drainage is not good they must have adequate foundations. Cinders are excellent, for they pack down firmly yet provide good drainage.

Garden Work for November

In many districts the major work in the flower garden will consist of completing the planting out of bedding plants.

In southern districts some beds of wallflowers and other flowering plants may still show some colour, but their removal should not be delayed. It is better to sacrifice their remaining beauty than to delay planting for the summer display. The new plants will otherwise be difficult to establish when the weather becomes too warm.

The preparation of soil and care of bedding plants were described in detail last month, but the importance must be stressed of adequate watering of the bed before planting. The plants should also be given a thorough watering some hours before they are to be lifted. Planting out is best done late in the day.

If hot winds should prevail after the planting out, watering must be attended to conscientiously until the plants are established.

Sowings of portulaca and African and French marigold can still be made, even in southern districts, where sowings can now also be made of wallflower, double daisy (*Bellis perennis*), and Iceland poppy.

Border Plants

To keep the border neat throughout summer staking and tying of the late flowering subjects must be done when required.

Spent blooms should be removed if the seed is not required. Delphiniums cut down during this month will still be able to give a good second flowering in the autumn.

Any plants which have been cut back after their first flowering and can be expected to flower again later in the season should be watered copiously; applications of liquid manure will be beneficial in giving extra vigour to the plant.

Now that the spring rush is over it is time to consider additions to the border, and many perennials can be raised from seed in the home garden. If sowings are made now, the plants will be large enough to be put out in their permanent positions next winter. Among such plants are: *Alyssum saxatile*, aquilegia, delphinium, gaillardia, Russell lupins, and pentstemon.

Chrysanthemums

Chrysanthemums will be well established now and should be "stopped" before they become too tall. Stopping consists of taking the top off the plant. The maximum height of the initial stem should be 6in. to 8in. It is better to remove a few inches than just to pinch the soft tip out of the shoot. If the latter is done, the plant may break away with only one or two shoots, whereas if it has been cut back into more hardened tissue more than half-a-dozen shoots will generally develop. If too many appear, the weakest should be removed. The number of shoots required will depend on the purpose the plants are grown for, but generally 3 to 6 shoots should be retained.

On late varieties the smaller number of shoots are generally left and they can then be stopped again when large enough, generally within a month, and enough stems should then have developed to make a good display.

Stopping, apart from producing more flowers on each plant, will assist greatly in making a smaller and more compact plant, which of course looks much better and is not so liable to be damaged by winds. Even so some kind of support is generally necessary and in the flower garden staking is the most satisfactory. The stakes should not be quite as tall as the plants are expected to grow and ties must be fixed whenever required.

One of the most troublesome diseases found on chrysanthemum is rust (*Puccinia chrysanthemi*), and steps should be taken to prevent it. One important factor in control is to assure that the growth of the plants is never checked, for example, through lack of water. Spraying at fortnightly intervals should be done with lime sulphur 3½ fl. oz. and colloidal sulphur 1½oz. to 4 gallons of water. This spray will also control powdery mildew.

Nicotine sulphate 1 fl. oz. may be added to this mixture for control of aphides. Lindane can also be used to control aphides, but should never be mixed with lime sulphur, as damage to the foliage may result.

Dahlias

Dahlias will be developing strong growth now and water should be applied copiously. Tying in should not be neglected and pest control is a necessity. Aphides and thrips are the main worries; they can be controlled with applications of nicotine sulphate, or better still lindane, at frequent intervals.

Gladiolus

In districts where thrips are known to be troublesome gladiolus should be sprayed regularly for this pest. Best results are obtained by D.D.T. or lindane emulsions made up according to the manufacturer's recommendation and applied at fortnightly intervals.

Narcissus Bulb Fly

The main flying season of the large bulb fly is from late October to December. The adult fly is nearly ½in. long and resembles a small bumble bee (see illustration at left). It may be seen on sunny days hovering above narcissus beds and nearby flowering plants. Eggs are laid singly on the bulbs or the foliage of narcissi and also in the neighbouring soil. It may also be found on certain other bulbs, but narcissus is the main host.

Frequent cultivation and a complete cover of soil over the bulbs will prevent the laying of eggs on bulbs and will also destroy many eggs before the larvae emerge and commence their destructive feeding on the bulb tissue.

FLOWER GARDEN WORK . . .

An additional control is spraying or dusting with D.D.T. or lindane at 7- to 10-day intervals; of these materials lindane is the most effective because it will also destroy the eggs.

Trees and Shrubs

Some of the early flowering subjects may still require pruning, and on some shrubs the best method is to trim them with hedge clippers after flowering. This will keep the plants compact in growth, and an abundance of new shoots will develop for flowering the next season. Shrubs which can be treated in this manner are diosma, polygala, erica, prostanthera, hybrid brooms, and the evergreen ceanothus.

Except on shrubs where berries are a feature, seeds should not be allowed to develop. By removal of the spent flowers all energy goes into production of new growth of the plant, which will result in better flowering; especially azalea, rhododendron, and lilac benefit by having the flowers removed as soon as flowering has finished. Unwanted suckers may by now have developed on many plants and also strongly growing water shoots. These are best cut back close to their bases or they can be pulled out to ensure that no regrowth takes place. If this is done during summer, pruning will be simplified the following winter.

Hedges

In many districts hedges will now be ready for their first trimming. New hedges especially should be cut frequently to ensure a compact and even growth, but it is never wise to let a hedge grow too long before is it trimmed; otherwise it will be much more difficult to keep in shape and far more energy is taken out of the plant.

Soft hedge trimmings can be placed directly on the compost heap.

Roses

The major flowering of roses will take place during this month. Spent flowers should be removed as soon as possible. No energy is then wasted by plants in producing seed, and petals can be secured before they are blown round the garden.

When spent blooms are removed from bush and standard roses and flowers are cut for decorative purposes the stems should be cut long enough to act as a summer pruning of the plant. The cut should be made just above the new shoots that are developing some distance down on the flower stem. This will force these shoots into growth immediately and a better and earlier second flowering will result.

Pest and disease control should be carried out regularly as described in the August issue of the "Journal".

Brown Beetles

November is the main flying season of the brown beetle (*Costelytra zealandica*). The adult beetle will feed on many trees and shrubs in the flower garden and can do much damage to foliage and flowers, especially on ornamental plums and roses.

In districts where this pest is prevalent control measures should be applied as soon as the beetles are noticed flying at dusk. D.D.T. applied as a spray at the usual strength at weekly intervals will protect the plants adequately.

When D.D.T. is used on roses or other flowering plants the spray should be kept off the open flowers; otherwise it may kill the bees. Even if open flowers are chewed by the beetles, the damage will be only temporary, as such flowers will be removed within a few days.

Abutilon megapotamicum

ABUTILON megapotamicum, which is illustrated above, is a beautiful shrub that is especially suitable for the small garden, as it generally grows only about 3ft. high and can be kept smaller by pruning or it may be trained up a trellis as a climber. Pruning is best done in winter and consists merely of trimming the bush into shape, as flowers are produced on the new young growths. Though the usual type has green leaves, there is also a form with variegated leaves.

The attractive flowers hang on long, slender stalks after the manner of fuchsia blossoms; the bright lemon-yellow petals extend below the red cape-like calyx. This contrast is further heightened by the rich, purple-brown pistil and stamens, which protrude from the flower.

Flowering generally begins in November and continues well into April and even May in coastal districts.

Megapotamicum means big river and commemorates the Rio Grande, Brazil, the home of the plant.

Provided it is well drained, any good neutral garden soil is suitable for the plant; it will grow equally well in full sunlight or partial shade, but it should not be planted in an exposed, windy position. If the above conditions are observed, the plant should grow and thrive practically anywhere in New Zealand.

Propagation is best carried out from cuttings, which may be easily rooted in a glasshouse from November to January. The cuttings should be from good growing tips of well-developed shoots 3in. to 4in. long and cut to a leaf joint. If bottom heat is used, cuttings will root in about a fortnight.

It is sometimes possible to strike cuttings in the open from January to April in a suitable shady position. In striking cuttings care should be taken that they are not allowed to wilt. This can be prevented by covering the cuttings after insertion with a glass jar.

A skewer about the thickness of a pencil should be used as a dibble and river sand trickled into the hole before the cutting is inserted. It is also a good plan to dress the beds of cuttings with about ½in. of river sand to provide drainage and keep down weeds.

When the cuttings have rooted they will make fresh shoot growth from the tips and they may be transplanted to permanent positions the following spring.

—F. E. WILKIN, Plant Quarantine Officer,
Department of Agriculture, Wellington

Man's Fair Isle Pullover in Four Colours

IN the trend toward more colourful knitted wear for men Fair Isle patterns maintain their popularity, especially for young men, and the four-colour example illustrated here, instructions for making which are given in the article, should supply a comfortable and attractive pullover.

ABBREVIATIONS: K., knit; p., purl; st., stitch(es); rep., repeat; beg., beginning; cont., continue; patt., pattern; tog., together; inc., increase(ing); dec., decrease(ing); g., grey; r., red; b., black; w., white; in., inches.

Materials: 3oz. of 3-ply wool in grey; 2oz. of 3-ply wool in red; 1oz. each of white and black 3-ply wool; 2 No. 10 and 2 No. 13 knitting needles.

Measurements: Chest, 40in.; length, 23½in.

Tension: 8 st. to 1in.

To read the chart: There are 16 rows and 18 st. to one patt. The odd-numbered rows are k. rows and are read from right to left. The even-numbered rows are p. rows and are read from left to right.

The Back

Using No. 13 needles and g. wool, cast on 144 st. and work 4½in. in k. 1, p. 1 rib.

Next row: Rib 8, * inc. in next st., rib 6. Rep. from * to last 3 st., rib 3 (163 st.).

Change to No. 10 needles and patt.:—

1st row: Join in b. wool and follow the chart thus: * K. 3 b., 3 g., 7 b., 3 g., 2 b. Rep. from * to last st., 1 b.

2nd row: P. 1 b., * 1 b., 3 g., 3 b., 3 g., 3 b., 3 g., 2 b. Rep. from * to end.

Cont. thus, working from patt. chart until work measures 14in. from beg.

Shaping the Armholes

Cast off 8 st. at beg. of next 2 rows, then, keeping continuity of patt., dec. 1 st. at both ends of every row until 109 st. remain. Cont. straight until work measures 23½in. from beg., finishing with a p. row.

Shaping the Shoulders

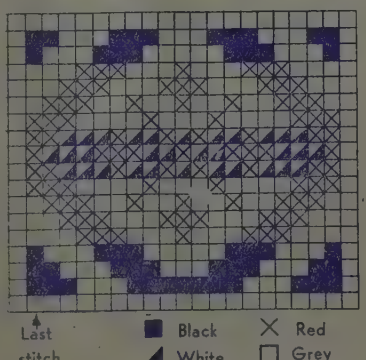
Cast off 10 st. at beg. of next 6 rows. Cast off remaining stitches.

The Front

Work as for the back to end of first 2 rows of armhole shaping (147 st.).

Next row: K. 2 tog., patt. 70, k. 2 tog., turn, leaving remaining stitches on spare needle. Work on these stitches only.

Next row: Patt. to last 2 st., work 2 tog.



* Next row: Patt., dec. 1 st. at both ends of row.

Next 2 rows: Patt., dec. 1 st. at armhole edge only *.

Rep. last 3 rows, that is, from * to *, 4 times more, then first 2 rows again. This completes the armhole shaping. Now keeping armhole edge straight, cont. to dec. 1 st. at front edge in the 2nd and every 3rd row following, until 30 st. remain, then cont. straight until work measures 23½in. from beg., finishing at armhole edge.

Shaping the Shoulder

Next row: Cast off 10 st., patt. to end.

Next row: Patt. to end.

Rep. last 2 rows once. Cast off. Rejoin wool at centre front to other set of 73 st., patt. to last 2 st., work 2 tog.

Next row: Work 2 tog., patt. to end.

Now work to match other side.

The Neck Border

Join right shoulder seam. Using No. 13 needles and g. wool, pick up and k. 90 st. down left side of neck to centre point, 1 st. at centre point, 90 st. up to right shoulder, and 50 st along back of neck.

1st row: (K. 1, p. 1) 69 times, k. 2 tog., p. 1, k. 2 tog., (p. 1, k. 1) 44 times.

2nd row: * P. 1, k. 1. Rep. from * to last st., p. 1.

3rd row: (K. 1, p. 1) 69 times, k. 1, p. 2 tog., p. 1, p. 2 tog., (k. 1, p. 1) 43 times, k. 1.

4th row: Rib to end, keeping st. at centre front as k. 1.

Cont. in this way, dec. 1 st. on either side of centre front st. on next and every alternate row until border measures 1½in. Cast off in rib.

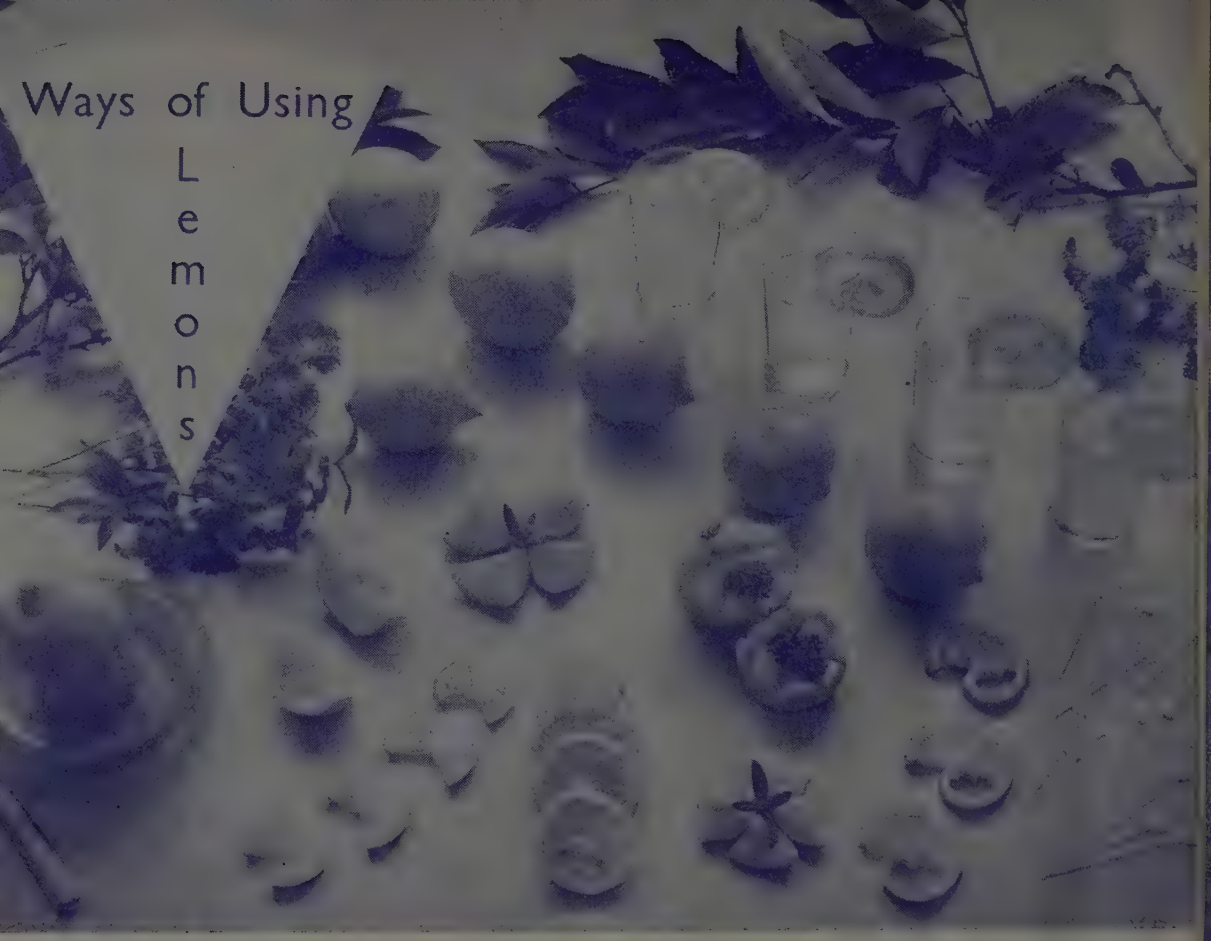
Armhole Borders

Join left shoulder seam. Using No. 13 needles and g. wool, and with right side of work facing, pick up and k. 200 st. evenly round armhole edge and work in k. 1, p. 1 rib for 1½in. Cast off in rib.

To Make up

Press work with a hot iron over a damp cloth. Join side seams. Press seams.

Ways of Using Lemons



THE uses of lemons in cookery are many and varied. The acid tang of lemon juice will give its own excellent flavour where desired and when used sparingly will bring out more subtle flavours of other foods with which it is combined. This article by Daphne Eilers, Field Officer in Rural Sociology, Department of Agriculture, Auckland, contains a number of new recipes using lemons as well as some of the old, tried ones which are always popular.

LEMON juice is an extremely valuable source of vitamin C and in winter, when other fresh fruits are scarce, the use of lemons in the diet is very desirable. Most housewives keep a store by them for that reason. When lemons are being picked for keeping it is important that the stem is cut so that the button end of the lemon is undamaged; the fruit should never be pulled off the tree.

If lemons are kept in a cool place, they will stay fresh for some time. Small quantities can be stored inside clear plastic bags in a refrigerator. The fruit can also be covered with a greasy preparation such as egg preservative and this may be an aid to longer keeping. It is important, however, to choose perfect fruit, to check them over at intervals, and to remove any which show signs of deterioration.

The bright colour and appetising smell of lemons make them extremely useful as a garnish for savouries, fish, and certain types of meat dishes. Lemon slices can be placed in cool drinks, slipped on to the edge of glasses (see illustration above), or as an interesting variation can be set in ice cubes with sprigs of mint.

Whole lemons can be used as solid bases for tit-bit savouries on toothpicks or as a decoration for a supper table.

Uses of Lemon Juice

When used instead of vinegar in salad dressing or mixed with salad oil, lemon juice will produce a milder and to some palates a more pleasing accompaniment to crisp lettuce salads.

Lemon juice sprinkled liberally on chilled melon or avocado pears brings out the flavour of these fruits. It is useful, too, to prevent browning of fruits such as bananas and pears. When jam is being made from fruit of low pectin and acid content the addition of lemon juice will assist the jam to set.

Lemon juice acts as a mild bleach and as such is effective as a rinse for fair hair. It should be diluted with an equal quantity of water and poured evenly over the hair when all shampoo has been removed.

A mixture of lemon juice and salt is often efficacious in removing fresh fruit stains and some ink stains and also for fading scorch marks. If the skins from lemons are kept handy to

HEADING PHOTOGRAPH: Lemons can be used in many ways as a garnish.

the preparation bench and used to rub over the hands after vegetables have been peeled or scraped, they will prevent staining.

Lemonade

Lemonade is always a pleasant thirst quencher and the following syrups can be prepared at leisure and kept covered in a refrigerator for instant use.

Lemonade 1

- 1 cup of sugar
- 2 cups of lemon juice (approximately 10 lemons)
- 4 teaspoons of grated lemon rind

Stir all the ingredients together until the sugar is dissolved, pour them into a jar, cover, and keep them in a refrigerator. To mix for drinks use ¼ cup of the syrup per tumbler.

Lemonade 2

- 2 cups of sugar
- 2½ cups of water
- 2 oranges
- 6 lemons
- Grated peel of 1 orange
- 1 cup of mint leaves

Combine the sugar and water and boil for 5 minutes. Cool slightly and pour the syrup over the mint leaves in a bowl. Add the grated peel of 1 orange and the juice of the 2 oranges and 6 lemons. Cover this and let it stand for 1 hour. Strain it into a glass container, cover, and store in a refrigerator. Allow ⅓ cup of this base for each glass.

Lemon Desserts

Lemon Flummery

- 1 tablespoon of flour
- 1 teaspoon of gelatine
- Juice of 1 lemon
- 1 cup of cold water
- ½ cup of golden syrup

From the cup of water take sufficient to mix the flour to a smooth paste and 2 tablespoons to dissolve the gelatine. Add the rest of the water to the flour paste; then add the syrup and lemon juice and heat until the mixture thickens and becomes clear. Stir in the dissolved gelatine. Pour into a dish and leave to set.

Lemon Chiffon Pie

Biscuit Crust

- ½lb. of wholemeal biscuits
- ¼lb. of butter

(This crust must be made the day before.)

Crush the biscuits until they are the consistency of breadcrumbs. An easy way is to put the biscuits in a large clear plastic bag and roll them with a rolling pin. Melt the butter and mix it thoroughly with the biscuit crumbs. Line a greased pie plate with this mixture and place a second greased pie plate on top. Then put a heavy weight on top. Leave overnight to set.

Filling

- 1 tablespoon of gelatine
- ½ cup of lemon juice
- ½ cup of water
- 1 teaspoon of lemon rind
- 1 cup of sugar
- 4 egg whites
- 4 egg yolks
- ¼ teaspoon of salt

Soak the gelatine in the water. Beat the egg yolks well, add half the sugar, the salt, and lemon juice and rind, and continue beating until the mixture is very light. Place it in a double boiler and cook until it thickens to the consistency of a pouring custard. Remove it from the heat and add the gelatine and water and stir until these are dissolved. Cool. Beat the egg whites with the remainder of the sugar and combine them with the cooled custard. Pour the filling into the biscuit shell and leave it to cool and set.

Below—Lemon chiffon pie.

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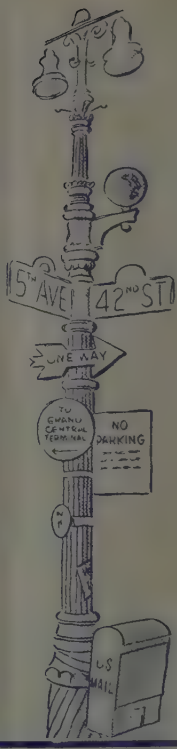

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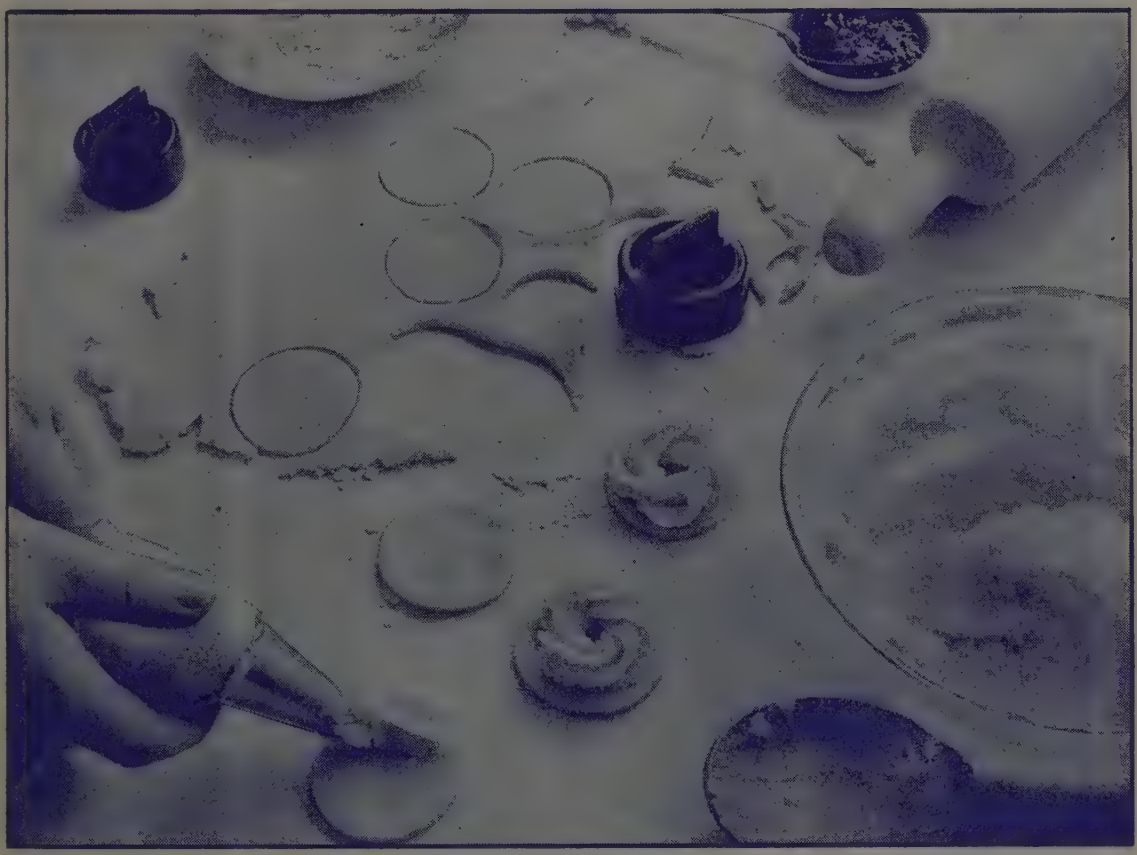


Lemon and almond biscuits being prepared.

Fluffy Lemon Pie

4 egg yolks
4 egg whites
1 cup of sugar
1 tablespoon of cornflour
½ teaspoon of salt
1 tablespoon of water
2 teaspoons of grated lemon rind
5 tablespoons of lemon juice
1 baked pastry shell (9in.)

Combine slightly beaten egg yolks, ½ cup of sugar, cornflour, salt, water, and lemon rind and juice. Cook these over boiling water until thick (stirring all the time). Beat the egg whites until stiff and fold in the remaining sugar. Fold this meringue into the custard mixture. Turn the filling into the baked pastry shell and bake in a moderate oven (350 degrees F.) until browned (15 minutes).

Lemon Pudding

1½ cups of fine breadcrumbs
Grated rind of 1 lemon
2 tablespoons of sugar
2 eggs
1 pint of milk

Mix the rind and sugar with the breadcrumbs and place in a greased piedish. Over this pour the beaten eggs mixed with the milk. Bake this in a slow oven until it has set. Then pour the following sauce over it before serving:—

Lemon Cheese Sauce

Juice of 2 lemons
Grated rind of 1 lemon
1 tablespoon of butter
¾ cup of water
1 egg (beaten)
1 teaspoon of cornflour

Heat the lemon juice, rind, butter, water, and beaten egg together and thicken with the cornflour mixed with a little cold water.

Lemon Moonshine

¾ pint of cold water
Grated rind of 1 lemon
Juice of 2 lemons
½ cup of sugar
2 eggs
1½ tablespoons of cornflour

Mix the cornflour to a smooth paste with a little of the cold water. Heat the remainder of the water, the grated rind, the lemon juice, and the sugar to boiling point. Thicken this liquid with the cornflour and remove from the heat. Add the beaten egg yolks and allow the lemon mixture to cool slightly. Beat the egg whites until stiff and fold them into the cooled mixture. Pour into a mould and leave to set. Serve with stewed fruit.

Biscuits and Cake

Almond and Lemon Biscuits

2oz. of butter
2½oz. of fine sugar
1 egg
4oz of flour
Raspberry jam
4oz. of ground almonds
1 teaspoon of grated lemon rind

Cream the butter with ½oz. of the sugar and beat in the egg yolk. Add the sifted flour and lemon rind and mix thoroughly. Roll out the dough ⅛in. thick and cut into rounds and place on a cold greased baking tray. Beat the white of the egg until stiff and fold in the remaining sugar and the ground almonds. Pipe a ring of the mixture round each biscuit, using a rose biscuit nozzle. Bake in moderate oven (375 to 400 degrees F.) for 15 to 20 minutes. When the biscuits are cool place a small amount of jam in the centre of each ring.

USING LEMONS . . .

Lemon Biscuits

4oz. of butter
4oz. of sugar
1 egg
1 lemon
8oz. of flour
½ teaspoon of baking powder

Cream the butter and sugar, beat in the egg, sift in the flour and baking powder, and add the lemon rind grated and 2 teaspoons of juice. Place teaspoons of the mixture on a greased oven tray and bake in a quick oven for 10 to 12 minutes. When cool join the biscuits in pairs with lemon icing.

Lemon Madeira Cake

3 eggs
6oz. of butter
1 teaspoon of baking powder
8oz. of flour
Juice and rind of 1 lemon
6oz. of sugar

Cream the butter and sugar; add eggs one by one. Beat well and then add lemon juice and rind and lastly flour and baking powder sifted together. Bake in a buttered cake tin in a moderate oven for 1 hour.

Fillings

Lemon Curd

1lb. of sugar
4oz. of butter
4 eggs (well beaten)
Rind and juice of 3 lemons

Place the sugar, butter, and lemon rind and juice in a double boiler. Stir until the sugar dissolves, cool slightly, and add the well-beaten eggs. Simmer the mixture until it thickens. Pour into sterilised jars and seal.

Lemon Jelly

1 cup of water
4oz. of sugar
2 tablespoons of lemon juice
1 teaspoon of lemon rind
1oz. of arrowroot

Mix the arrowroot to a paste with a little of the water. Heat the remainder and when it is boiling stir it into the arrowroot paste. Return it to the heat and cook for 2 to 3 minutes, add the sugar, and stir until it is dissolved. Remove from the heat and add lemon juice and rind. Allow the mixture to cool and then use it for cake filling.

Jam and Marmalades

Lemon Jam

1lb. of lemons
3 pints of hot water
3lb. of sugar

Wash, dry, and slice the lemons. Cover them with the hot water and soak for 48 hours. Take out 2 cups of the liquid and replace it with 3 cups of fresh water. Cook quickly for 1 hour, then add warmed sugar, and cook quickly again until the jam gives the jelling test. Bottle and seal. Freshly picked lemons give the most satisfactory results.

Lemon Jelly

8 large lemons
8 pints of cold water
Sugar (as required)

Wash and dry the lemons and peel them thinly. Shred the peel finely. Remove the white pith from the lemons and tie this with the pips in a muslin bag. Cut the lemon pulp roughly and put it into a preserving pan with the water and rind and the bag containing the pith and pips. Simmer about 1½ hours. Strain the fruit through a scalded jelly bag, allowing some hours for the juice to drip through. Measure the juice and allow an equal quantity of sugar by volume. Boil the sugar and juice for 15 to 20 minutes or until it jells. Bottle while hot.

Lemon and Apple Marmalade

6 lemons
A few cloves
1lb. of cooking apples
Sugar (as required)

Peel the lemons thinly and shred the peel. Remove pith and pips and cut the pulp into slices. Cover the peel and pulp with water and allow them to stand overnight. Peel, core, and slice the apples and boil them until tender in a small amount of water. Combine lemon pulp, rind, and juice, apples, and cloves and boil for 1 hour. Add sugar in the proportion of 1lb. of sugar to 1lb. of pulp and boil all again until the syrup gives the jelling test.

All photographs by Sparrow.

A Convenient Airing Cupboard

[*Campbell*

IN the modernising of a rural home the former kitchen on the sunniest corner of the house was converted to a sun room. The removal of the kitchen range and the fitting in of a controlled-burning space and water heater in the adjoining room on the wall immediately behind where the kitchen range formerly stood necessitated alteration of the location of the hot water cistern. This was effected by placing the cistern in the space left vacant by the range. As the cistern occupied only half this space, opportunity was taken to install a large airing cupboard.

The illustration shows the completed cupboard. If a few easily accessible screws are undone, the whole framework of racks and shelves may be removed to allow easy access to the hot water cylinder should this be necessary. The shelves are slatted to allow free circulation of air. The dowel rods on the insides of the doors are useful for airing towels, sheets, and similar articles and are especially handy for infants' clothing. The recesses in the doors are 3½in. deep, the cupboard stands 5ft. high, and when the doors are closed it protrudes only 5½in. from the wall.

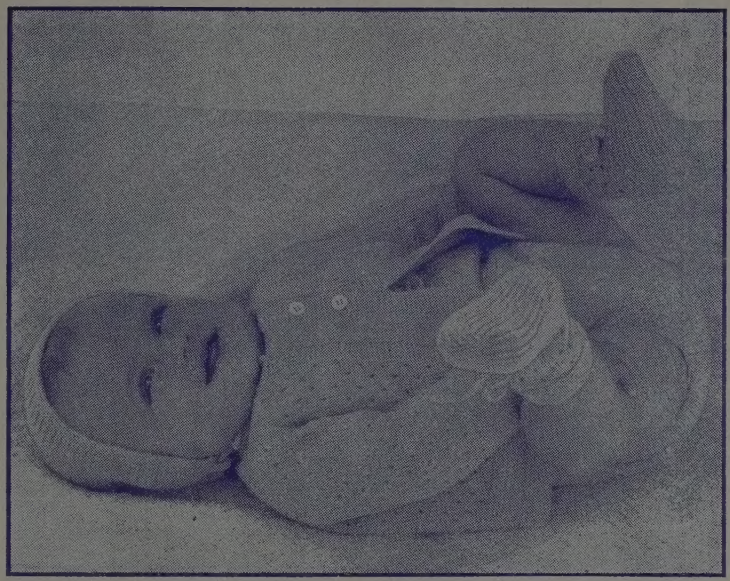
The housewife is particularly pleased with its capacity and convenience; her only criticism is that the top dowel rod is too close to the top of the cupboard for maximum use.

The space on the right of this cupboard formerly occupied by the hot water cistern was enlarged and made into a drying cupboard with a well-protected electric heating unit at floor level and sufficient ventilation holes to allow free circulation of air.

With these two amenities the housewife is not unduly inconvenienced by a spell of inclement weather.

—MAUD B. STRAIN, Field Officer in Rural Sociology, Department of Agriculture, Dunedin

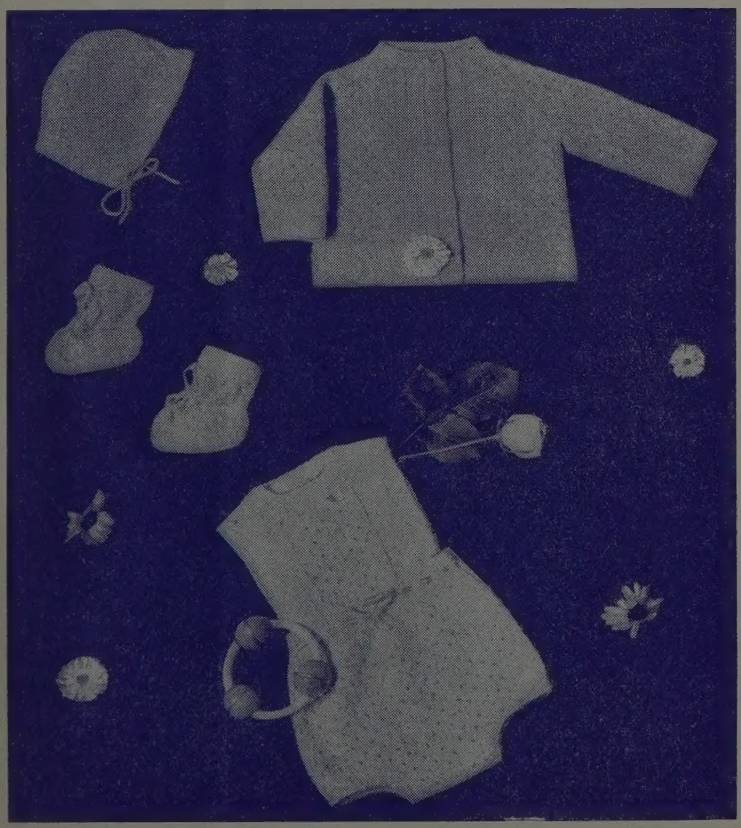
Pram Set for a Boy of 6 Months



A BOY of 6 months likes to be both active and comfortable, and the knitted garments illustrated at right and below will allow him freedom of movement and keep him warm and comfortable.

ABBREVIATIONS: K., knit; p., purl; st., stitch(es); p.s.s.o., pass slip stitch over; rep., repeat; tog., together; cont., continue; st.st., stocking stitch; g.st., garter stitch; patt., pattern; inc., increase(ing); dec., decrease(ing); sl., slip.

Materials: 8oz. of baby wool; 1 pair each of Nos. 10 and 12 knitting needles.



Tension: With No. 10 needles, 8 st. in pattern to 1in.

The Pattern

Number of st. divisible by 6 plus 3 st.

1st row: Knit.

2nd and all alternate rows: Purl.

3rd row: * K. 4, wool forward, sl. 1, k. 1, p.s.s.o., rep. from *, ending with k. 3.

5th row: Knit.

7th row: * K. 2 tog., wool forward, k. 4, rep. from *, ending with k. 1 instead of k. 4.

8th row: Purl.

Rep. these 8 rows.

The Coat

With No. 10 needles cast on 181 st. and k. 11 rows. Cont. in st.st., except for 17 st. at both ends of needle which are worked in g.st. After 7 rows work in g.st. with the 155 centre st. for 7 rows. Then cont. as follows: K. 7, 6 st. in st.st., k. 4, 147 st. in patt., k. 4, 6 st. in st.st., k. 7. Cont. in this manner until work measures 5½in. Now cast off for armholes as follows: Work 45 st., cast off 4 st., work 83 st., cast off 4 st., work 45 st. Place work aside and begin sleeves.

The Sleeves

With No. 10 needles cast on 45 st. and k. 11 rows. Then 7 rows in st.st., and again k. 7 rows. Cont. in pattern. Inc. 1 st. at both ends of every 8th row 3 times. When sleeve measures 5½in. cast off 3 st. at both sides of work. Work second sleeve in same manner.

Now join all parts tog. as follows: Take 45 st. of one front, 45 st. of one sleeve, 83 st. of back, 45 st. of second sleeve, and 45 st. of second front. Now there are 263 st. on the needle. Cont. as before, matching patt. Make 4 buttonholes in right front border. Make first buttonhole when work measures 5¾in. and the others at intervals of 1½in. Work buttonholes 3 st. from front edge and 2 st. wide. After 4 rows dec. 8 times in every right-side row as follows: Work 43 st., k. 2 tog., sl. 1, k. 1, p.s.s.o., work 41 st., k. 2 tog., sl. 1, k. 1, p.s.s.o., work 79 st., k. 2 tog., sl 1, k. 1, p.s.s.o., work 41 st., k. 2 tog., sl. 1, k 1, p.s.s.o., work 43 st. In next row work the passed-over stitches in purl. Cont. in this manner, dec. 2 st. for back and sleeves, and 1 st. for each front in every right-side row until 95 st. remain. Then dec. in one row to 87 st. Change to No. 12 needles and work 12 rows in g.st. Cast off.

The Hat

With No. 10 needles cast on 111 st. and work 5 rows in g.st. Change to No. 12 needles and cont. in rib of k. 1, p. 1 for 1¼in. Change back to No. 10 needles and cont. in patt. When hat measures 4in. from beginning of border, dec. in one row to 108 st. and cont. in g.st. with all st. Dec. in every row as follows: K. 2 tog., k. 25, k. 2 tog., k. 25, k. 2 tog., k. 25, k. 2 tog., k. 25. Next row thus: K. 24, k. 2 tog., k. 24, etc. Cont. in this manner until 16 st. remain. Draw thread through the 16 st. and fasten securely.

The Bootees

With No. 10 needles cast on 45 st. and work 11 rows in g.st. Cont. in patt. When 2 full patterns are completed, cont. in g.st. for 2 rows.

3rd row: * K. 2, wool forward, k. 2 tog., rep. from *, ending with k. 1.

4th, 5th, and 6th rows in g.st.

7th row: Place the first 15 st. on a spare needle or safety-pin, k. 15, place the remaining 15 st. on a safety-pin. Cont. in patt. with the 15 centre st. for 16 rows. Now knit the 15 st. from one safety-pin, then pick up and knit 12 st. along side edge of instep. Knit the 15 st. of instep, pick up and knit 12 st. along other side of instep, and knit the stitches from second safety-pin. Cont. in g.st. with all st. for ¾in. Then dec. 1 st. at both sides of instep and 1 st. immediately inside the 3 last st. at both ends of needle in every 4th row 3 times. Cast off remaining st.

The Rompers

Back

With No. 10 needles cast on 21 st. and work in patt. When work measures 1½in. inc. 1 st. at both ends of every row 8 times. Then cast on 25 st. at beginning of next 2 rows. Cont. in patt., dec. 1 st. at both ends of every 16th row 3 times. When work measures 8in. change to No. 12 needles and work in rib of k. 1, p. 1 for 8 rows (before changing needles end patt. with a 4th or 8th row). When border measures 8 rows work next row as follows: * K. 1, p. 1, wool around needle, p. 2 tog., rep. from *, ending with k. 1. Work 7 more rows in rib of k. 1, p. 1. Now cast off 10 st. at beginning of next 2 rows. Change to No. 10 needles and cont. as follows: K. 7, 6 st. in st.st., k. 4, 27 st. in patt., k. 4, 6 st. in st.st., k. 7. When work measures 15in. cast off for each shoulder 8 st. at the beginning of next 2 rows. Cast off remaining st.

The Front

Work as given for back until work measures 14in. Now cast off for neck opening: First the 19 centre st., and then 1 st. at both sides of neck opening 5 times. When work measures 15in. cast off for each shoulder 8 st. at the beginning of the next 2 rows.

To Make up

Press all parts lightly on wrong side.

Coat:. Sew together and sew on buttons.

Rompers: Join gusset seam. With No. 12 needles pick up about 88 st. along each leg opening and work 10 rows in rib of k. 1, p. 1. Cast off. Join side seams. With No. 12 needles pick up 36 st. along back of neck opening, a few rows below cast-off edge, and work 8 rows in rib of k. 1, p. 1. Cast off. Pick up 48 st. along front of neck opening and work in same way. Close shoulders with 4 buttons and loops.

Bootees: Sew together.

Hat: Join back seam. With No. 12 needles pick up about 80 st. along lower edge and work 5 rows in g.st. Next row: * K. 2, wool forward, k. 2 tog., rep. from *. Work 4 more rows in g.st. Cast off. Crochet a chain cord for rompers, hat, and bootees and thread through holes.

Loquats in Cooking

By NELL MACPHERSON,
formerly Field Officer in Rural Sociology, Department of Agriculture, Auckland

LOQUATS are not much grown commercially in New Zealand, but many house gardens have one or two trees. The fruit grows in clusters and ripens to a golden yellow during October and November. Some loquat varieties bear heavily and have large fruits. These are the most suitable for stewing and jam making, though the smaller ones can also be used for jam making and for jelly.

AS one of the first fruits of the year loquats, which have a delicious flavour, are most often eaten raw. The seeds, which are large in proportion to the flesh, should be removed before cooking. The skin is tougher than apple skin, but it is softened by cooking.

Stewed Loquats

Make a syrup of 2 cups of water and 1 cup of sugar. Wash the loquats and halve them to remove the seeds. Put the loquat halves into the syrup and simmer them gently for ½ hour or until they have absorbed about half of the syrup.

Stewed loquats can be served with junket or custard or similar milk puddings.

Loquat Jam

Use slightly under-ripe fruit for jam and jelly.

Recipe 1

3lb. of loquats — 1½ breakfast cups of water
3lb. of sugar

Remove the seeds from the loquats, cut them roughly, and sprinkle 1lb. of sugar over them. Leave overnight. Add the water and boil until the fruit is soft. Add the remaining sugar and stir until it is dissolved. Boil until the jam jells. It should be a rich red.

Recipe 2

4lb. of loquats — 1 pint of water
4lb. of sugar

Cut up the loquats and remove most of the seeds. Boil the loquats with some seeds in the water until the fruit is tender. Skim off the seeds with a perforated spoon and add the warmed sugar, stirring until it is dissolved. Bring the jam to the boil and boil it hard until it gives the setting test.

Loquat Jelly

Cut up 12lb. of loquats, removing most of the seeds, and cover the fruit with water. Bring to the boil and boil for 2 hours. Strain through a jelly bag. Measure the juice and allow 1 cup of sugar for each cup of juice. Boil the juice for 10 minutes. Add the warmed sugar and a good pinch of citric acid. Boil hard until the mixture jells. Set aside for 5 minutes. Skim the surface and pour the mixture into heated jars. Allow it to get cold, then cover it with melted paraffin wax.

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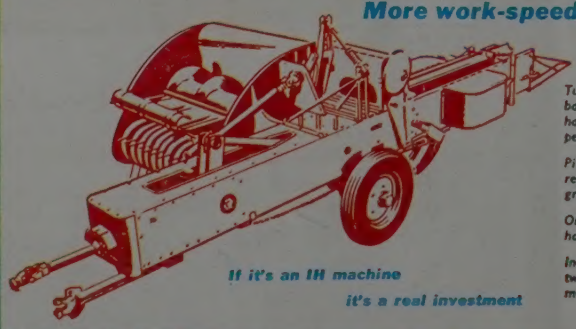
Easy extraction of silage from the pit is a further advantage; the twine does not perish and the bales can be loaded individually on to a barrow or truck. As an eminent advocate of the system said, "You can throw away the hay knife!"

Baling of silage also gives you an approximate measure of yield per acre and simplifies rationing of feed to stock.

Find out all about this new technique from your IH dealer — or send for the *Free* 20-page book, 'SILAGE AND THE PICKUP BALER'.

INTERNATIONAL HARVESTER COMPANY OF N.Z. LTD.
P.O. Box 563, Christchurch

More work-speeding advantages



Turns out up to 5 standard-length bales of hay or straw, or up to 10 half-length bales of green material per minute.

Picks up the heaviest crop cleanly, regardless of stubble height or ground conditions.

One man — the tractor driver — handles the entire operation.

Incorporates the famous McCormick twin knotters which need the minimum of adjustment.

If it's an IH machine it's a real investment

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